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The Camel that walked a mile for a drink...

Cleo was a smart camel, as camels go. She needed a lot of water to keep her humping, and that water had to be good. Cleo didn't know the danger of untreated water but she'd walk a mile any time for a bracing drink of pure water.

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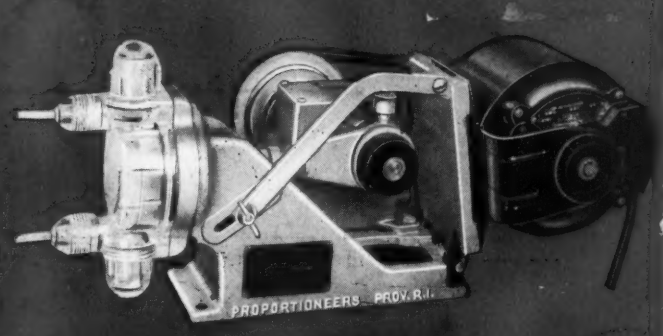

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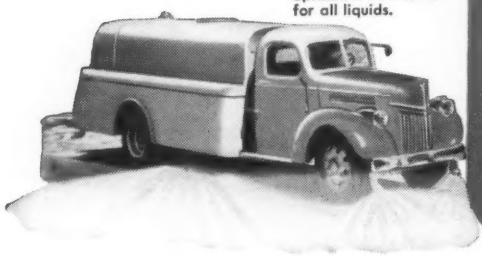

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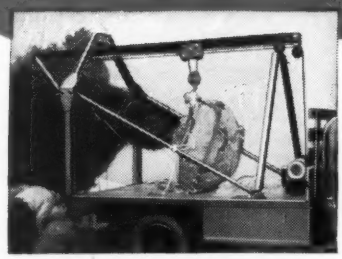

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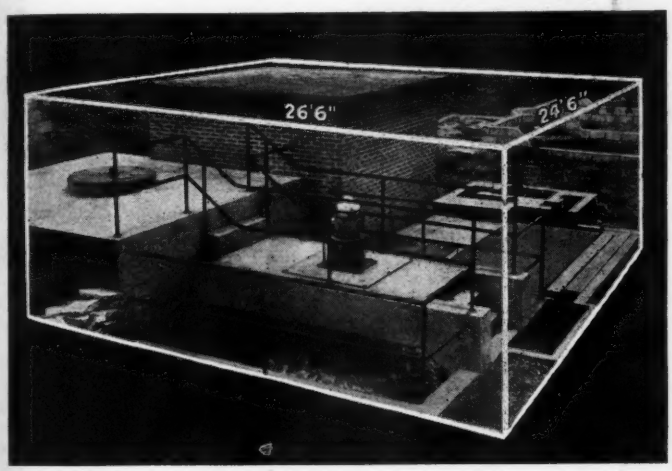
5-YEAR OPERATION RECORD OF TYPICAL CHICAGO "PACKAGE" SEWAGE PLANT

Year	Avg. Daily Flow 1,000 G.P.D.	Avg. Daily B.O.D.			% Reduction			Avg. Daily Suspended Solids			% Reduction		
		Raw	Primary	Final	Avg. for Year	Min. Month	Max. Month	Raw	Primary	Final	Avg. for Year	Min. Month	Max. Month
1940	39	367	304	12	96.7	95.8	97.5	179	60	5	97.2	96.1	97.6
1941	71	325	259	12	96.3	95.1	98.0	178	86	8	95.5	93.4	98.7
1942	67	339	299	17	95.0	94.5	98.0	192	89	9	95.2	91.5	98.7
1943	69	461	397	18	96.1	91.3	98.0	199	87	7	96.5	94.0	98.2
1944	59	421	408	31	92.7	88	95.0	217	97	11	95.0	86.7	98.3

This data is based on composite samples taken semi-weekly continuously throughout each year—Not grab samples during periods of good treatment. It shows that there is no accumulation of B.O.D. going into the receiving stream.



Chicago "Package" Sewage Treatment Plant at Mt. Mercy Sanitarium, Dyer, Ind. Design Capacity, 20,000 GPD. The stationary engineer of the sanitarium also operates the sewage treatment plant. The plant is composed of a Comminutor, primary tank, Combination Aerator-Clarifier, pump house, digester and sludge beds.

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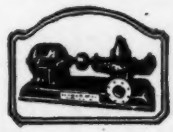

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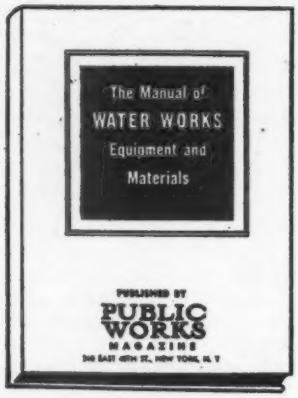

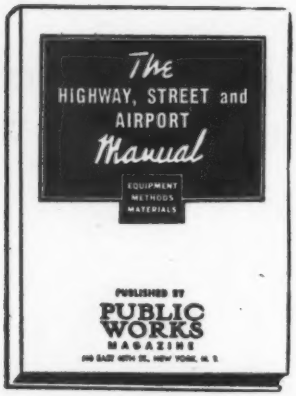

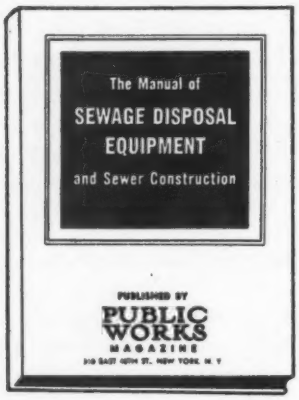

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Founded in 1896

Devoted to the interests of the engineers and technical officials of cities, counties and states

Vol. 76 No. 9

A. PRESCOTT FOLWELL, Editor

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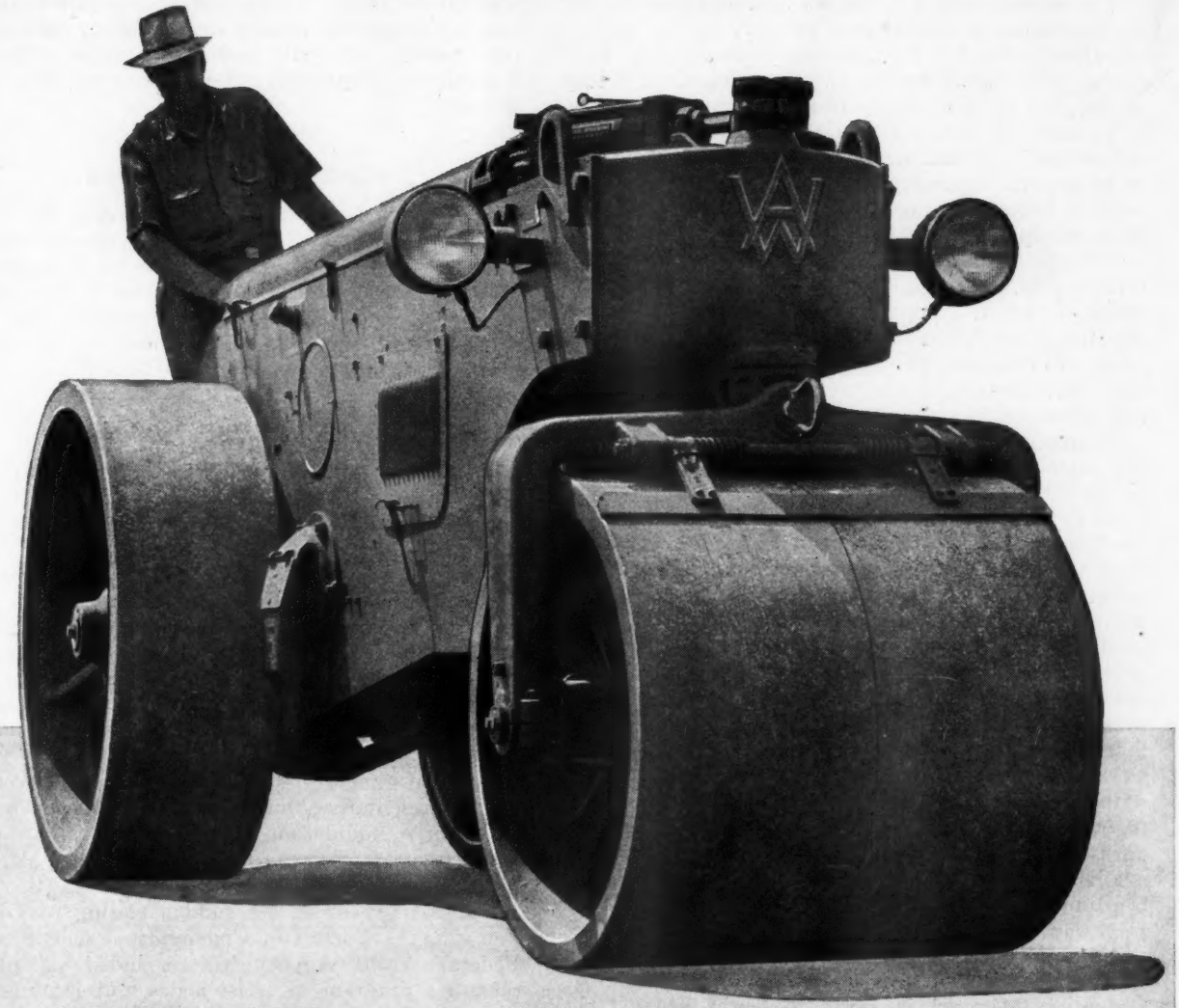
They all like it!



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When you need special information—consult the classified READER'S SERVICE DEPT., *pages 75-77*

POSTWAR PROBLEMS

The sudden ending of the war, followed at once by the relaxation of control over industry by the numerous alphabetical federal agencies, finds all of us wondering just "where we are at." The immediate future of supplies of everything, from butter to bulldozers, looks very favorable according to some "competent authorities" and much less so to others. There seems to be general agreement, however, that the readjustment to peace conditions will be more rapid than had been anticipated.

Officials connected with public works—highways, water works, sewerage, airports, etc.—have three chief concerns—labor, equipment and finances. The labor situation is spotty—more men than jobs in some places, more jobs than men in others. At present, skilled labor such as engineers, draughtsmen, mechanics, chemists and plant operators is not adequate for the demand of even present conditions; and return to normal, including catching up with deferred maintenance, will increase this demand.

As to finances, most governmental units are in better condition than they have been for years. It is true that financial aid under the Lanham Act is being withdrawn (see below), but this was of minor moment, and we believe that few who had taken advantage of it are unable to carry on without it if they wish to. On the other hand, federal funds by the hundreds of millions are available for highway work; $106,000,000 is left over from previous federal aid allotments; $500,000,000 a year is available to the states for highway work under the Federal-Aid Highway Act of 1944 with the declaration that the war emergency is over*; together with $57,750,000 for roads in national forests, parks and Indian reservations. Among state funds available may be mentioned $30,000,000 on hand for beginning a $65,000,000 highway project by the Texas Highway Department; the North Carolina Highway and Public Works Commission has approved budgets totaling $26,500,000 for state, county and municipal highways; Missouri is ready to begin $14,000,000 worth of highway work in a 4-year program totaling $86,000,000.

As to equipment, the immediate outlook is uncertain, but by the end of the year, if not before, that necessary should be obtainable. One manufacturer, International Harvester Co., stated on September 1st that it expected to build 36,000 trucks between then and December 31; needed 400 more workers at once and another 1,000 by the end of October. The Westinghouse Electric Appliances Division expects to be back to peacetime normal production by November 30 and many others are equally optimistic. There is still a large amount of surplus federal equipment to be sold by the Office of Surplus Property (consult Regional Offices). A sale in Boston Sept. 7 included tractors, cranes, concrete mixers, pavement breakers, pumps, road rollers, scrapers and industrial tracks.

Lumber has been the most critical material in the construction field, but WPB reported a few days ago that by September 30th sufficient should be available to meet all construction requirements. Other materials used in the public works field are already available; and manufactured articles such as water meters, motors, pumps, etc. will probably be obtainable with comparatively little delay by those who get their orders in early.

*The President, in his message to Congress September 5th, asked for a public works program which included "the release for immediate expenditure of postwar highway spending authority voted by Congress to become effective at the rate of $500,000,000 a year for each of the first three postwar years."

Order U-1 Eliminated

WPB announces that, effective Sept. 30, it will eliminate order U-1, covering construction of new electric, water and gas facilities. At the same time the AA priorities system will end. Also WPB approval will no longer be required for construction of buildings costing more than $25,000; restrictions on cheaper buildings were removed after V-E day.

Lanham Act Aid Withdrawn

Allotments under the Lanham act for non-Federal construction projects (those for which the Federal Government has contributed a portion of the cost) have been rescinded except where contracts had been approved before August 14th. FWA will continue to make allotments on projects already approved for "the operation of general hospitals, recreation programs for service men and *miscellaneous municipal service projects in areas where the war impact requires continuation of these services*" until Oct. 31; policies will be established Oct. 10 as to continuation of aid beyond that date.

Division supervisors of War Public Services and field representatives will assist applicants in "making an orderly liquidation of project operations or in transferring from operations under Federal assistance to operations entirely under local finances."

To partially offset the sudden ending of Lanham Act aid, the Bureau of Community Facilities of the Federal Works Agency has expanded its advance planning program to assist states and local governments in the preparation of plans for needed public works.

Federal Aid for Airport Projects

Next to highways, airports seem to offer the greatest promise for widespread employment on public works. Many states, counties and municipalities have ambitious plans made or in the making for construction of airports of all sizes, from the largest to accommodate heavy commercial planes to small "airparks" similar to that described in this issue. The Civil Aeronautics Administration plans the construction of 3,000 new airports as soon as possible.

Federal aid to this program is confidently expected. Both House and Senate committees have recommended legislation, the former to provide $700,000,000 for a 10-year program, the latter $500,000,000 for a 5-year program; and it is almost certain that this session of Congress will make available $75,000,000 to $100,000,000 a year for this purpose. Both bills provide $3,000,000 for use immediately for making local surveys, and both require the matching of federal funds for construction by states and cities receiving them.

PUBLIC WORKS Magazine . . . September, 1945

VOL. 76. NO. 9

Eldon's "Guinea Pig" Airpark

This city and the Missouri State Department of Resources and Development are constructing and will try out a new type of airport, low in cost and combined with recreational facilities.

By EUGENE V. FRYHOFF

Head of Aviation Development, Missouri State Dept. of Resources and Development

"AIRPARK" is a new word, coined by aviation leaders to designate a new type airport.

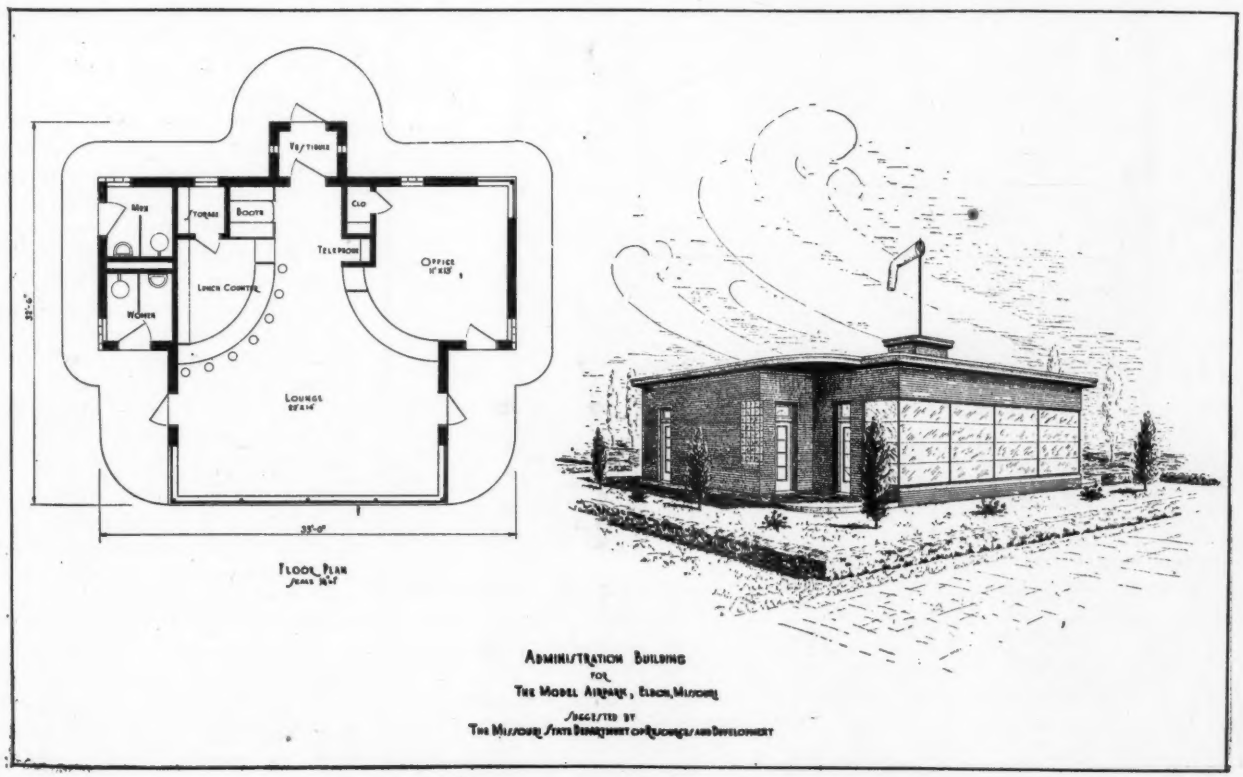
An airpark is an attractive small airport designed to accommodate the personal plane pilot and non-scheduled commercial flight operations. It usually has only two turf flight strips in the shape of an L, T or X. In addition to the flight strips, it provides parking facilities, taxi roads, and the necessary service buildings and facilities to properly serve the flying public.

Parks and recreational facilities are recommended also to increase the business and pleasure value of the airpark.

Airports are generally considered expensive, while airparks are designed to be inexpensive. Many communities can afford airparks; few can afford airports, especially those which have several concrete runways, which are very expensive.

Members of airport committees, civic leaders and city officials have asked the writer on many occasions, "What is an airpark?", "How much does one cost?", "Can we afford one?", "Will it meet our needs?", "Will it be self-supporting?".

To answer these questions and to demonstrate that an airpark is the answer to 90% of our airport needs,



Artist's sketch and floor plan of administration building to cost $5,000.

a Model Airpark is being constructed at Eldon, Missouri, population 2,590. The project is jointly sponsored by the Missouri State Department of Resources and Development and the City of Eldon, Missouri. It has also been endorsed by leading aviation organizations, and by the aviation press which recognizes the value of a "guinea pig" airpark.

Eldon citizens voted $25,000 in bonds to finance the development (roughly, $10 per capita). This sum is to take care of purchase of the land (101 acres plus a modern bungalow), clearing the land, grading, drainage, entrance road, parking areas (auto-aircraft), fencing (8,000 feet), turfing, flight strips, landscaping and construction of a small administration building. Records are being kept of all planning, financing, construction costs, and management contracts and records of revenue and operation costs for a period of five years.

The Model Airpark is located at the northeast edge of Eldon and is within the corporate limits of the town. It lies adjacent to U. S. Highway #54, which connects it to Bagnell Dam and the Lake of the Ozarks, twelve miles to the south.

The site is gently rolling and provides excellent drainage, which is essential for any airport or airpark, regardless of cost. Surface water is collected between the aircraft parking area and the hangar area and passes through an eighteen-inch tile under the north-south taxi strip and through a twenty-four inch tile under flight strip "B." All drainage is from west, southwest to east, northeast. Flight strip "A" is a "natural," as it slopes gently in three directions, north, south and east, and has excellent drainage and good fertile soil.

Flight strip "B" required a fill of 5,000 yards in the center, near the drain tile. The south half of the flight strip was crowned to provide good drainage in two directions. Water from the west half passes through the eight-inch drain tile under the east-west taxi strip. The open ditch areas provide an emergency reservoir in case of extra heavy rains which cause flash floods. Recent heavy rains have tested the drainage system thoroughly and they were found to be adequate.

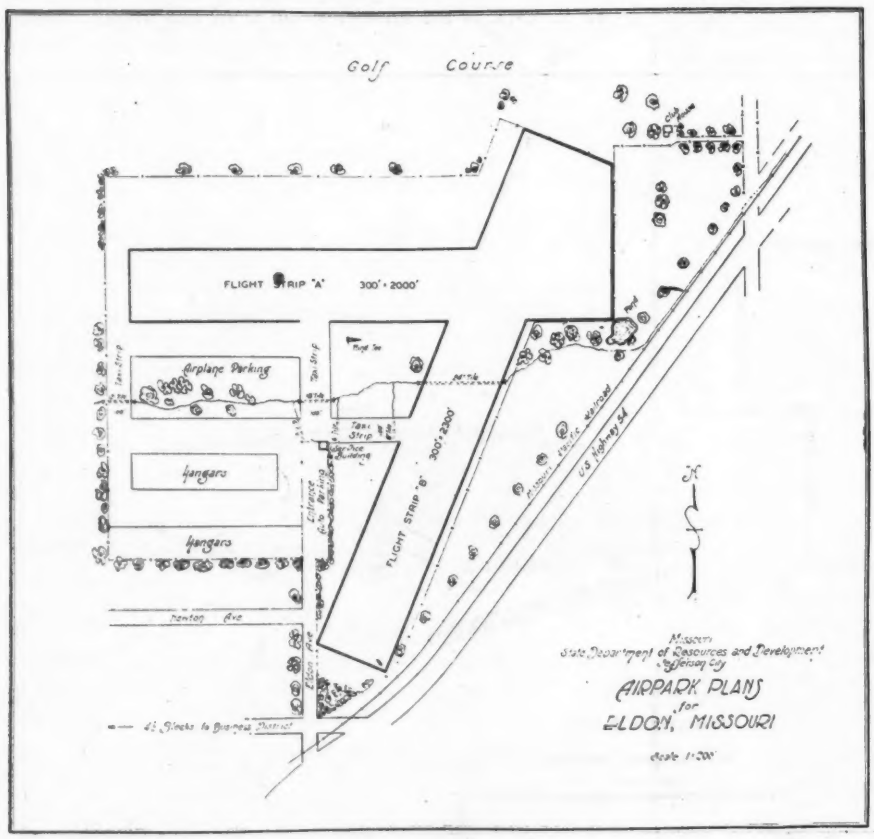
Blue grass, red top and timothy seed were used to develop a turf on the flight strips. Additional research work is to be done this fall by a national seed company, to develop a more adequate turf to withstand severe traffic expected in the future.

The entrance road and auto parking area will be of oil mat construction (as are the city streets). Most of the trees shown in the blueprint existed on the site and have been trimmed and are a part of the landscape plan. Plans for the golf course must await the end of the war; however, the park area to the east of the airpark is to be completed.

Special equipment for the airpark includes a mobile service station, being developed by Shell Oil Company; a small administration building which was co-designed by the State Department of Resources and Development and the Butler Manufacturing Company of Kansas City, Missouri; and field markers which were designed by the Department of Resources and Development.

The administration building will be 35′ x 27′ and will provide an office for the airpark manager, two rest rooms, a small refreshment counter, a telephone booth and a lounge with an excellent view of the airpark. The building is to be pre-fabricated out of steel and glass and the entire cost, including fixtures and the foundation, is estimated at $5,000. It is a one-story building and very modern in appearance.

The Model Airpark was built with local equipment and manpower furnished by the city and the special road district. A bulldozer and a front-end loader and several dump trucks to move 5,000 yards of dirt, were rented from local dirt contractors. The 5,000 yards of dirt were secured from along the Missouri-Pacific right of way adjacent to flight strip "B" and in addition to providing the necessary fill material, it improved the view from the highway.



Plan for Eldon's airpark.

Construction cost records to date indicate that the job will be completed for around $25,000, as originally estimated, in spite of the very wet spring and summer which delayed operations and added to construction costs.

Facts and figures about the Model Airpark will be published and distributed by the City of Eldon, the State Department of Resources and Development and leading aviation organizations, in a booklet called "Model Airpark." This booklet will be ready in time for the dedication, which is being sponsored by the Personal Aircraft Council of the Aircraft Industries Association, Inc. The time of the dedication will be announced as soon as O.D.T. travel restrictions permit.

Water Supplies for Scattered Populations

Disadvantages of long lines of pipe of size ample for fire protection. Methods of furnishing fire protection with the use of 2-inch pipe or smaller.

MOST municipalities, both large and small, have experienced the tendency of increasing numbers of citizens to scatter into the fringes of the city or create "ribbon" developments following the roads leading from the cities.

This presents a number of problems to the municipalities, not the least of which is that of satisfying the demand of these scattered populations for water supply and sewerage.

For the latter, individual septic tanks, or larger ones, each serving a group of houses, may be a solution, or one of the small-capacity treatment plants offered by several companies.

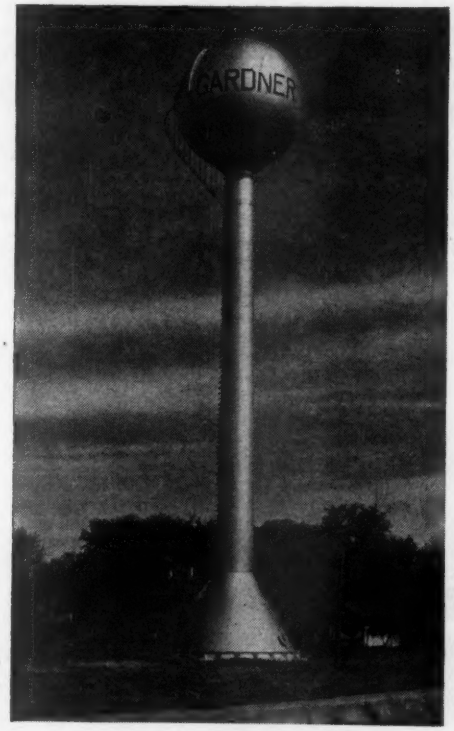
For water supply, however, where satisfactory water cannot be obtained from individual shallow wells, the alternative seems to be extending the municipality's distribution system—in some cases several thousand feet along roads on which there are few or no consumers. For these lines, 1½ or 2 in. galvanized pipe will furnish an adequate supply for several houses for domestic consumption only, but will be useless for direct fire protection by use of fire hydrants. To furnish this, a pipe that is a thousand feet or more long should be at least 6 in. in diameter—8 in. if several thousand feet.

The cost of such a pipe is considerable; but fully as important is the effect upon the quality of the water. A pipe of this size would hold 2,600 gal. per thousand feet, which probably would be sufficient for the domestic consumption by five houses for four days; or a mile of it would hold three weeks' supply. The effect on taste and odor of furnishing such stale water and the deposits likely to occur in the pipe with most waters might be quite objectionable. Where chlorine is used (as it is in more than 80% of present supplies) it is considered desirable to insure a residual in all parts of the distribution system; but even with the use of chloramine, it is doubtful if any would be found after a week's flow through such a main.

A possible solution is to store a supply for fire fighting in a surface pool or underground tank, to be drawn upon by fire engine pumpers or fire pumps permanently housed nearby; or store it in an elevated tank. These could be kept full by flow from a 1½ or 2 in. pipe at night when there is little domestic consumption. The pool might be used as the central feature of a public park.

The National Board of Fire Underwriters informs us that "For the ordinary house and separate garage or house and barn, it is estimated that at least 500 gallons of water a minute would be needed to prevent the fire from spreading to the adjoining structure or to take care of a fire which had pretty completely involved the roof and keep it from spreading down to the other portions of the building. To fight such a fire, this supply of 500 gallons might well be needed for a period of one-half hour, and it would probably be desirable to figure on a total capacity of any static water supply such as a pond or cistern on the basis of the fire lasting one hour. This would mean about 30,000 gallons, which would be a pretty sizable tank or cistern."

A pool to hold 30,000 gal. might be 3 ft. deep and circular with a diameter of about 40 ft. An elevated tank 15 ft. deep and 18½ ft. diameter would have this capacity. San Francisco maintains a number of underground cisterns scattered throughout the city for use in fire fighting in case an earthquake should rupture

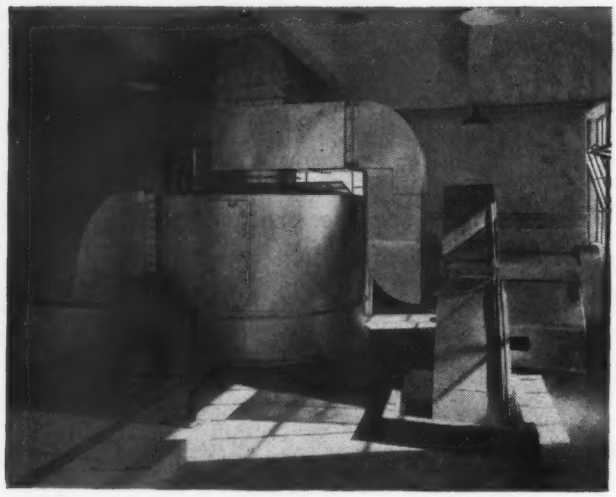


Watersphere at Gardner, Ill.

the mains. Most of these hold 75,000 gallons, but 17 have only half this capacity.

However, furnishing water for fire protection for a group of five or six houses may not be financially worth while. According to the law of averages, such a group would not have a fire for a period of 10 years. Also, at least 90% of the fires that occur in dwelling houses can be extinguished with less than 100 gal. of water. Again, chemical extinguishers, either small ones in each home or chemical tanks carried by the fire department, will extinguish most fires in residences. For many years a certain section of Bridgeport, Conn.,

(Continued on page 38)



Vapor cyclone and vapor fan

Boom Town San Diego

By BYRL D. PHELPS

Assistant Port Director, City of San Diego, California

(Formerly Assistant City Engineer, in charge of design and construction of this plant)

SAN DIEGO, California, a residential city on the west coast known for its wonderful climate and natural harbor, awoke one day with a war at its front door and two hundred thousand persons attempting to make this city the homespot of the west coast.

A most important problem was to eliminate the emptying of raw sewage into San Diego Bay. To help the city health problem, Federal assistance was obtained to construct a complete trunk sanitary system around the bay of San Diego, and the construction of a sewage treatment plant was recommended by the U. S. Navy. The trunk line was designed for an ultimate population of 700,000 persons to be reached in 1960. The sewage treatment plant was designed for a population of 375,000, which it was thought would be attained in 1945.

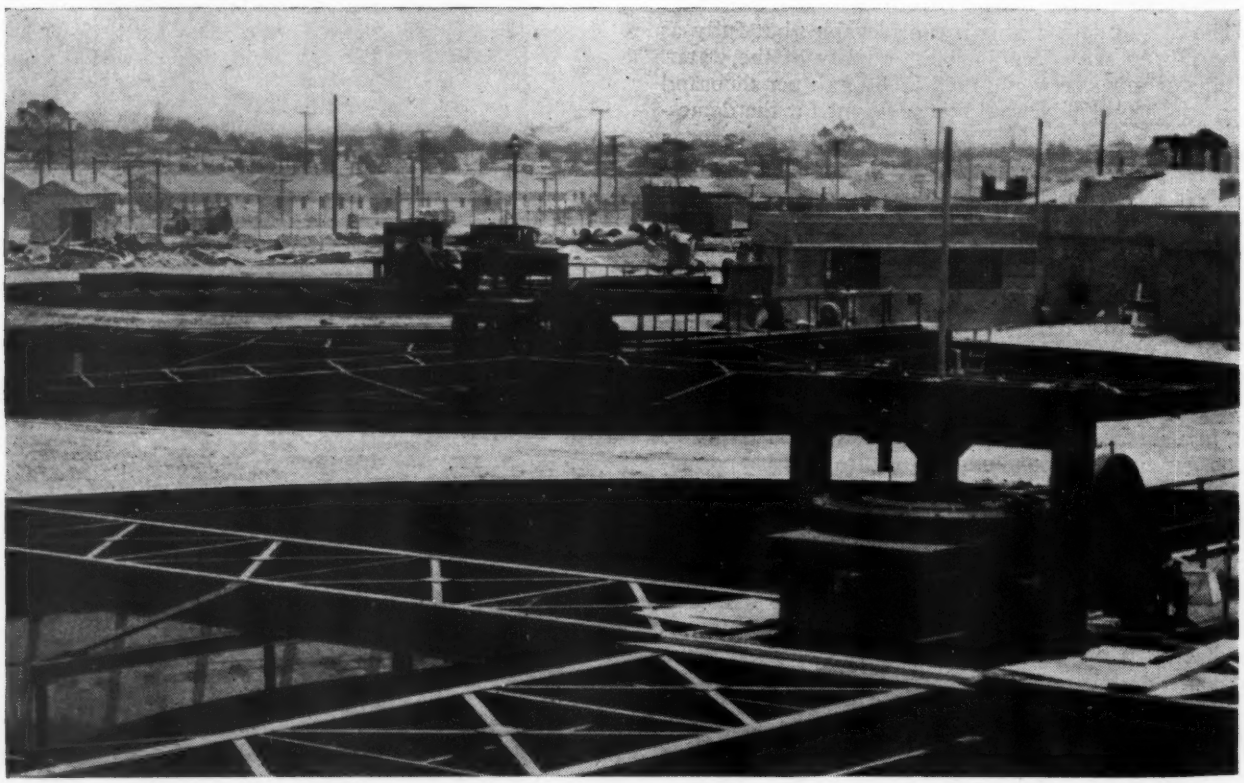
The plant was designed for the following loads:

Maximum flow of 85 gal. per capita per day . . 319 mgd
Maximum flow of 18 gal. per capita per day . . 6.7 mgd
Average flow of 55 gal. per capita per day . . 20.6 mgd

Boom town days arrived in 1942 and the population began increasing so rapidly that soon all available housing was utilized. The Federal agencies built in any available space and the population increased to 450,000 by 1944. An occasional overdose of Navy and soldier population even brought the population at one time to 475,000 persons.

The interceptor sewer was of sufficient size but the trunk lines leading to it were too small to handle the sewage of such a population. After a rapid campaign in which additional trunk lines were proposed in almost every section of the city, a $2,000,000 bond issue was passed in 1942.

On June 18, 1943, the sewage treatment plant was put into operation. This plant consists of separate sludge digestion with heat used for sludge drying, all of which was described in a preview article in PUBLIC WORKS, July, 1943. The following will attempt to describe some of the problems of starting a new plant that never had a chance to grow to its capacity.



General view of treatment plant. Top of clariflocculators in foreground. Housing project within 200 ft. of the plant.

iegolves a Sewage Problem

Operation of a new plant which includes comminutors, detritors, aeration tanks, vacuators, clariflocculators, elutriation tanks, vacuum filters, sludge dryers and fertilizer weighing and sacking equipment.

Operation of the Treatment Plant

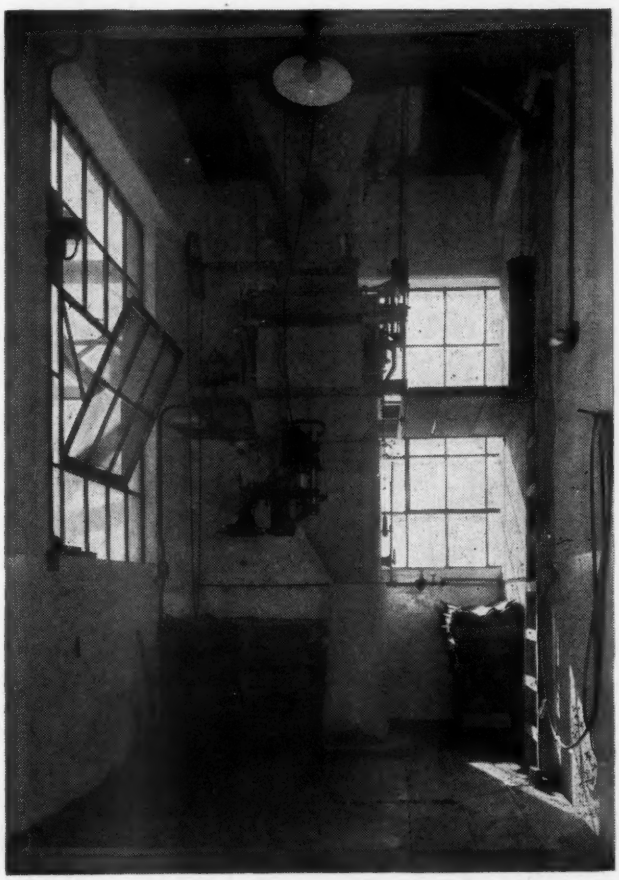
The sewage enters the plant through a hydraulically operated control gate at elevation 20. This gate drops if the electrical power is stopped for any reason. (It was originally decided to have two sources of power but W.P.B. put thumbs down on the extra cable. The plant had just about got under a good load and a power failure took place, causing the gate to drop. By the time the power had been turned on, the head on the 60" diameter interceptor sewer had so increased that the entire detritor building was flooded. In this case explosion and moisture-proof motors and switches proved their value. Since that time we have installed two manually operated gates so that the flow can be controlled. Also the extra power line has been installed.)

The sewage then passes through two Chicago 20 mgd comminutors, which grind the sewage to ⅜" minus particles.

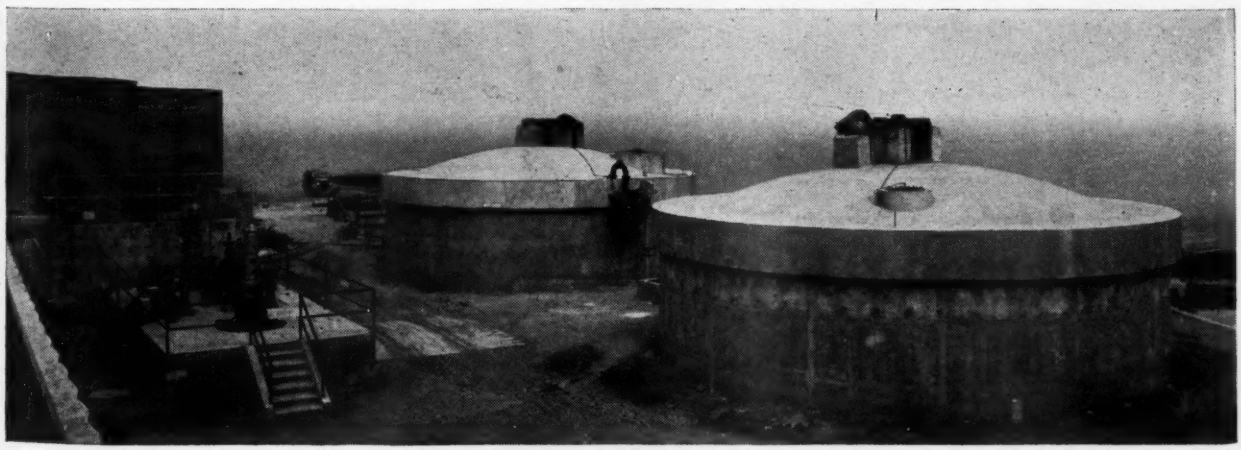
The flow then passes through a Dorr detritor. At first the sand amounted to .5 cu. yd. per million gallons but after several months' operation it dropped to .3 cu. yd.

The entire detritor building is 20 feet below ground. The odors were not bad, for the sewage is not septic, but the moisture and ferric chloride added for odor control at the hydraulic gate caused the paint to discolor, and a complete ventilating system was later added to the building with open vents at the bottom of the floor and between the roof beams. The result has been to remove all odors, and all moisture has disappeared from the walls.

During the first month of operation, the detritor room became filled with gasoline fumes. Written no-



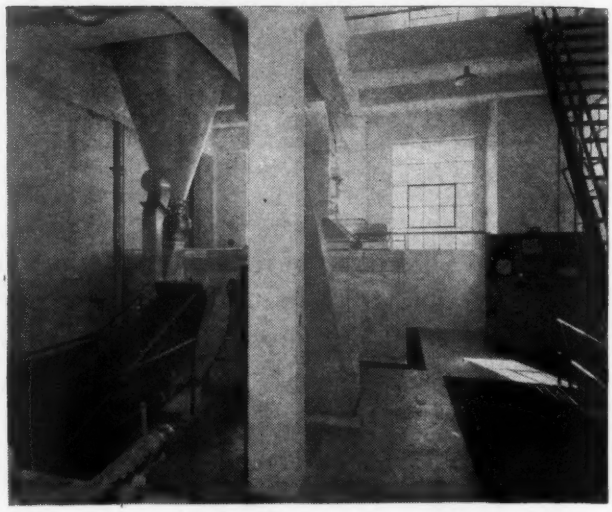
Fertilizer bagging room, showing automatic sludge sacking and sewing machines.



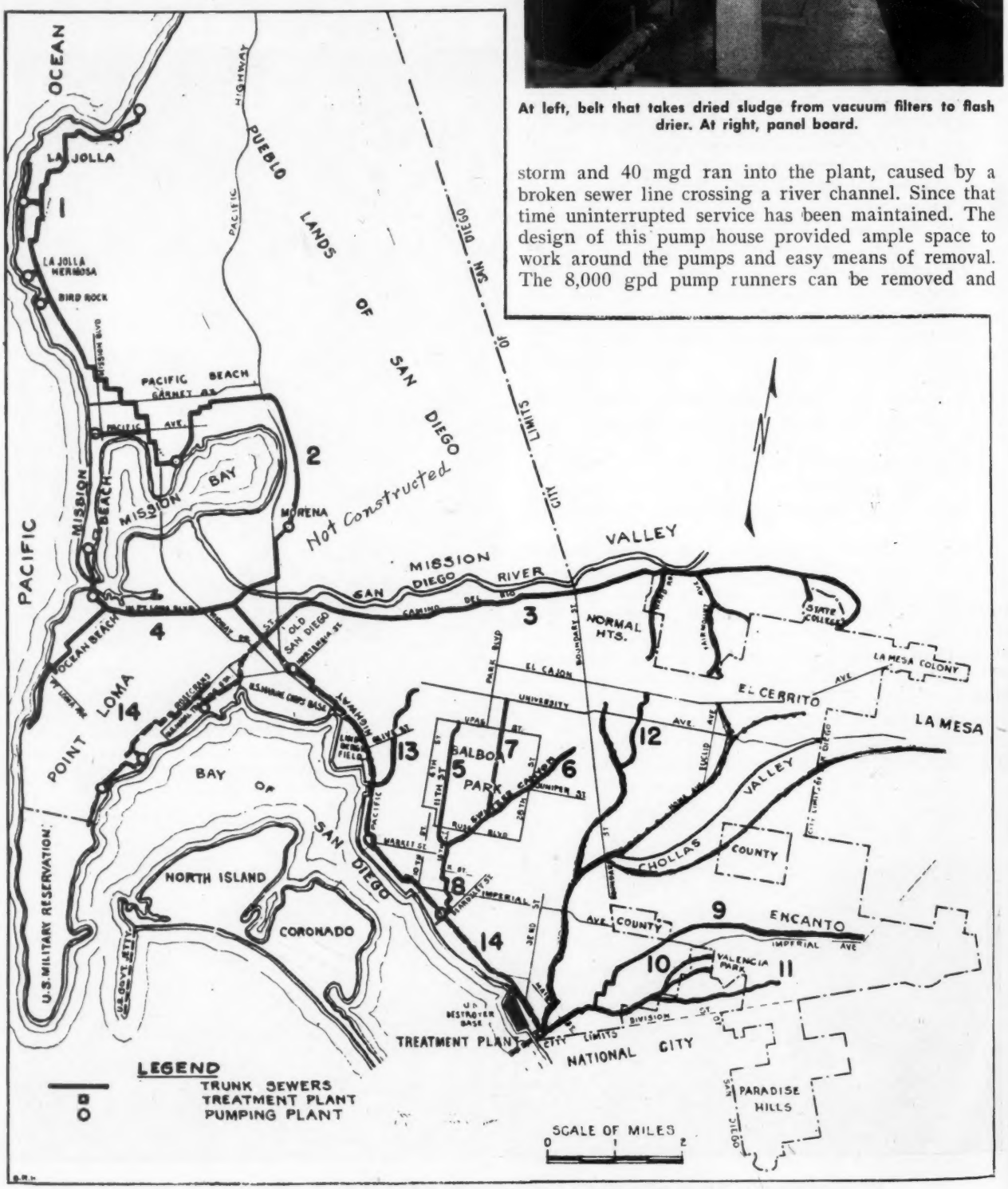
Left—Digestion tanks covered with stone tile. Center—Aeration tanks with pumps on top. Right—Vacuators.

tice was sent to all cleaning establishments and gasoline wholesale dealers telling of the damages of putting gasoline into the new sewer system and stating the amount of fine to be imposed on any offender, and the gasoline fumes ceased.

The sewage next enters a tile-lined wet well, from which it is lifted by seven Fairbanks-Morse pumps, varying in capacity from 8,000 gpm to 1,000 gpm and operated by a specially built selector switch, which will start or stop whichever pump or pumps are necessary to pump from 1,000 gpm to 32,000 gpm. These pumps have all given fine service except one of the 8,000 gpm pumps, vibration in which made it necessary to remove it. While it was out we had an unusual rain storm and 40 mgd ran into the plant, caused by a broken sewer line crossing a river channel. Since that time uninterrupted service has been maintained. The design of this pump house provided ample space to work around the pumps and easy means of removal. The 8,000 gpd pump runners can be removed and



At left, belt that takes dried sludge from vacuum filters to flash drier. At right, panel board.



San Diego, showing sewers constructed 1939 to 1944.

10,000 gpd runners substituted; which change will soon be required as the plant is greatly overloaded.

The next operation consisted in passing the sewage through two aeration tanks, each having a capacity of 100 cu. ft. per minute. This particular unit has caused some trouble, and the type of flash mixer has been changed and the motor size increased. Also air is added at the bottom of the tank to keep the sewage in suspension.

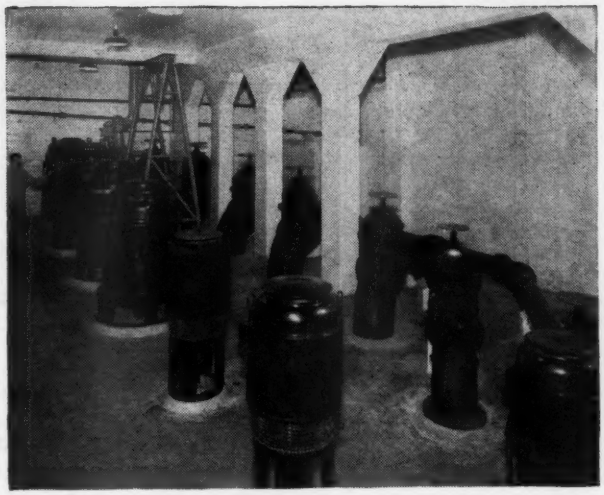
The sewage then flows to the Dorr "Vacuators." Due to the fact that this was the first large Vacuator constructed, it had not been possible to work the experimental items over, and a number of items have been added to it. During the early operation, extreme changes in flow from 5 mgd to 20 mgd peak upset the vacuum on the tanks. Adjustment of this piping and the equalizing of the flow by the gates has made it possible to obtain better average flows of about 18 mgd and get a removal of about 35% of the suspended solids. (It has been extremely difficult to get typical samples of this removed matter.) The dirty surface of the clariflocculators was immediately improved when proper operation of the Vacuators was maintained, and this in turn helped to eliminate odor.

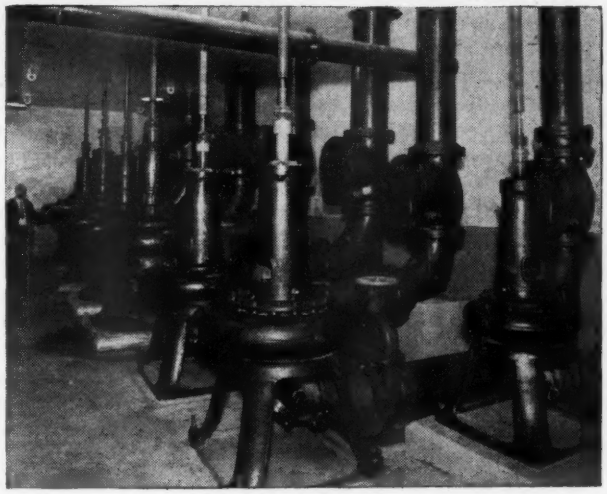
The site we had chosen for the plant was one mile from any dwelling, but a new housing project was built about 200 ft. north of the plant and the Navy built buildings 100 ft. south of it. The odors are just about tolerated and that is all, and everything is being done to control them. Additional chlorine equipment has been requested to help eliminate odors which occur during days when heavy air currents drift towards the housing project.

It was planned to use the three clariflocculators alternately but the peak flow has made it necessary to use all the equipment continuously. The average removal of suspended solids is 80.1% and average removal of settling solids is 94.5% when the plant is running on a normal flow of 20 mgd.

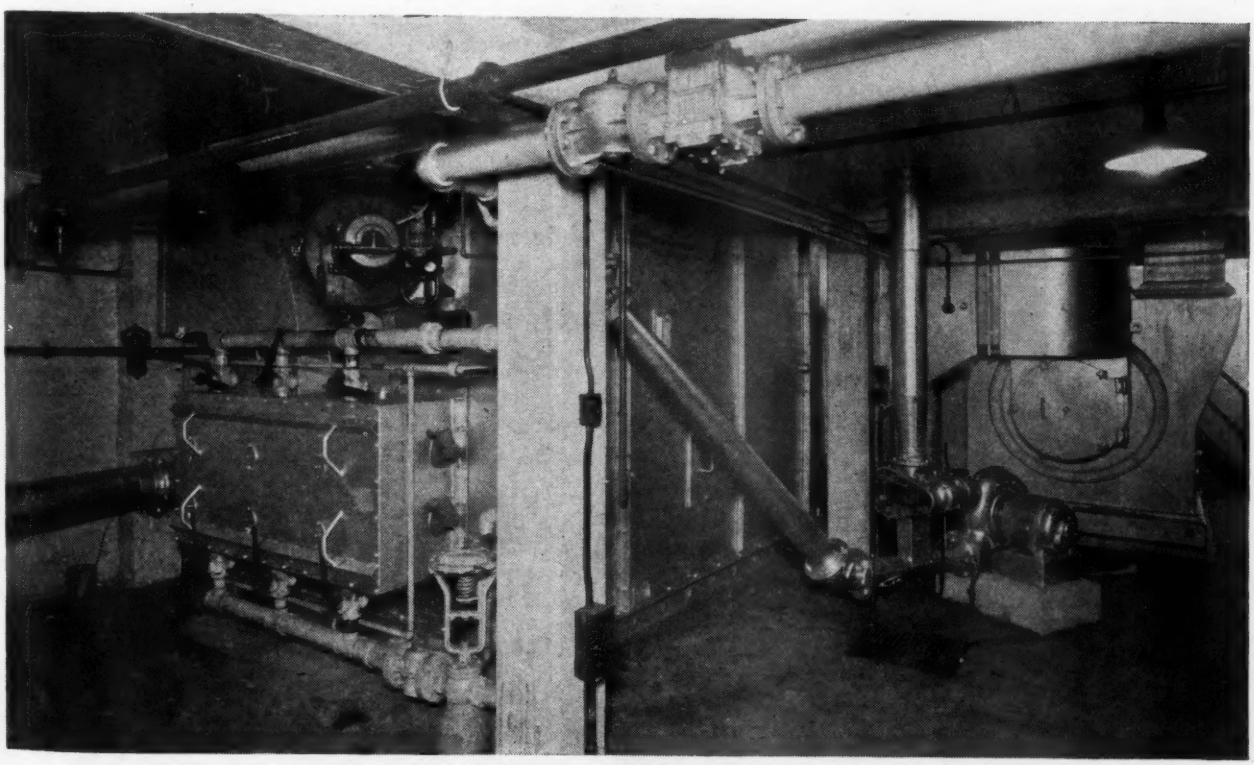
The effluent is carried 1,200 ft. into San Diego Bay

(Continued on page 44)





Above, Fairbanks motors, driving (below) 1,000 to 10,000 gpm pumps.



Pipe lines are painted different colors to denote use.

Precautions fo

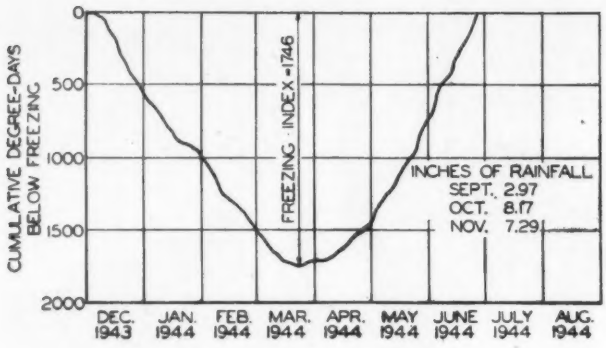


Fig. 2—Frost penetration and temperature vs. time.

HIGHWAY engineers in the northern part of the country have learned by experience that, unless frost-susceptible soils are covered by a pavement and base not susceptible to frost action and of sufficient thickness, pavement damage by highway traffic will occur during frost-melting periods. This thickness for highway loads in northern New England is generally less than the average frost penetration, except in unusual cases. Recently constructed flexible-type pavements with bases on soils susceptible to frost action vary between two and three feet total thickness in Maine, and about two feet in New Hampshire. The damage due to frost weakening is often very serious and warrants taking every practicable method to avoid it, and thorough investigation to learn what methods are best to employ under various conditions.

The subgrade soils at Dow Field, Bangor, Maine, during the winter of 1943-44 experienced severe frost action which resulted in a heaving of pavement surface during the freezing period and a loss in shearing strength of the subgrade soil during and immediately after the frost melting period. The United States Engineers, with a view to preventing the recurrence of this and learning how to prevent it in future pavement construction, conducted an investigation at that airport the following year. This was described by William L. Shannon, Engineer, U. S. Engineers Office at Boston, in a paper before the Highway Research Board. A brief outline of this paper is given in the following article.

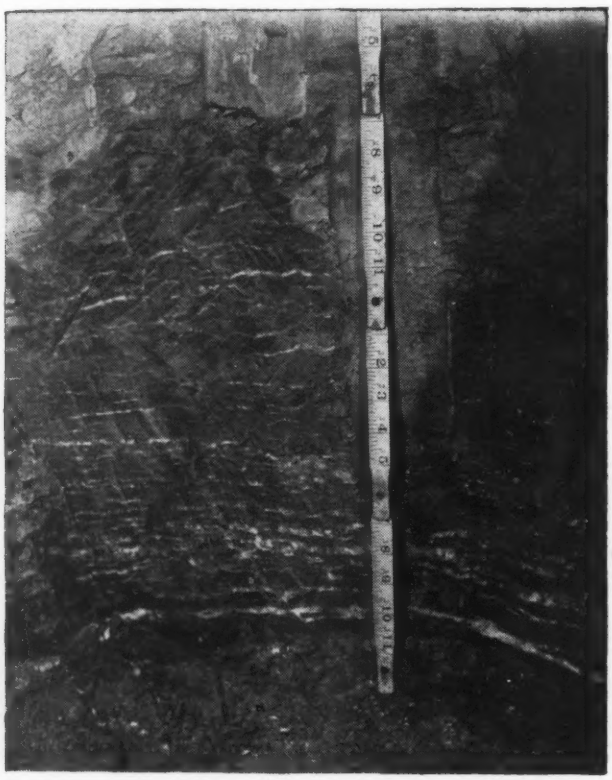


Fig. 1—Photograph showing ice lens formation in lean clay subgrade.

The detrimental effect of frost action occurs during the thawing periods, when the moisture in the subgrade, accumulated in the form of ice segregation, is released, thereby softening the soil. The formation of the ice crystals begins in the larger voids, which crystals grow by accretions to form lenses, and these continue to grow so long as freezing conditions continue. The expansion of the water in freezing heaves the soil; if the heaving is not uniform, the pavement becomes uneven and may crack.

When the frozen soil thaws rapidly from the top downward, the water is kept from draining off by the ice lenses below and the soil becomes soft. A slow thaw with occasional periods of freezing may permit the excess water to drain to and through the shoulders.

Frost action within a soil is a function of its void size. Soils susceptible to it are those with more than 10% finer than 0.02 mm in size if of uniform grading, or more than 3% if of non-uniform grading.

The Engineer Dept. has established design criteria for flexible pavements over frost-susceptible subgrades. "The most generally accepted method of insuring pavement or base course stability . . . is to provide sufficient thickness of insulating material not affected by frost action (clean, well-graded, gravelly or sandy soils, or fine-grained soils treated by proven methods). The required thickness of base course material as determined by the California Method may not be sufficient to preclude frost penetration in the subgrade or lower zones of the base course, even though the base course material itself is relatively nonfrost-heaving, hence it is often required that additional thickness of insulating material be provided to insure proper protection against frost action. Prior to the determination of the required thickness of nonfrost-action soil, the range and average of frost penetration beneath pavements in the region should be determined from local records. In general, to insure stability of flexible pavements and surface treated bases, the combined thickness of pavement and nonfrost-action base material should be equal to the average depth of frost penetration, except that the maximum required thickness (in locations where frost is a factor) is as follows:

Gross weight of plane used for design	Maximum required combined thickness of pavement and nonfrost-action base material
120,000 pounds	40 inches
74,000 pounds	30 inches
30,000 pounds or less	20 inches

"The above maximum thickness should be used whenever the underlying soil affected by frost is fine-grained. If the soil affected by frost is a coarse-

voiding Frost Heaving of Pavements

Observations of pavement heaving and tests with wheel loads of 10,000 to 40,000 pounds led to conclusions as to depth of gravel base necessary.

grained soil or the base is composed of insulating material such as slag, cinders, etc., the maximum required thicknesses may be less than the values shown above, depending upon the character of the insulating soils and drainage conditions, but in no case should the maximum required thickness be less than 75 per cent of the above values. Nonfrost-action material used to insure stability of underlying soil, subject to frost action, should be thoroughly drained. In lieu of providing an insulation layer over a frost-heaving subgrade it may be feasible and desirable to remove the frost-action subgrade material, particularly where it is of local occurrence.

"Accurate methods of evaluating the actual bearing value in soils affected by frost action are not known. Highway experience indicates that, in areas which are subject to frost action, the base course of nonfrost-heaving material under a 6 or 7-inch slab, as used for highway loads, should extend to a depth of at least 50 per cent of the average frost penetration, in order to provide suitable subgrade reinforcement. For the heavier wheel loads being used in airfield pavement design, the base course thickness required will be greater than that used in highway design."

To prevent cracking due to frost heaving, "a base course should be constructed to produce uniform movement. If the subgrade consists of both frost-heaving and nonfrost-heaving soils, highway experience has indicated that all of the frost-heaving soil should be removed to the full depth of the average frost penetration. The areas should be backfilled with a compacted select material to provide uniformity. It should be noted that cohesive soils may be used in the lower layers of thick base courses, if the soil has sufficient bearing value to provide a suitable modulus of soil reaction at the surface of the base course for pavement design."

The Engineer Department is now carrying out a comprehensive frost investigation program to develop detailed design criteria for airport pavements, of which the Dow Field tests form a part. These included:

(a) Detailed explorations and tests to determine pavement, base and subgrade conditions in the selected test areas.

(b) Observations of pavement heaving and ice lens formation in the subgrade during the freezing period.

(c) Performance of traffic tests using wheel loads from 10,000 to 40,000 pounds during the frost melting period.

(d) Field California Bearing Ratio tests upon the subgrade soils and field bearing tests upon the pavements during the frost melting and summer periods.

Fig. 4—Photograph of test area on a lean clay subgrade after failure.

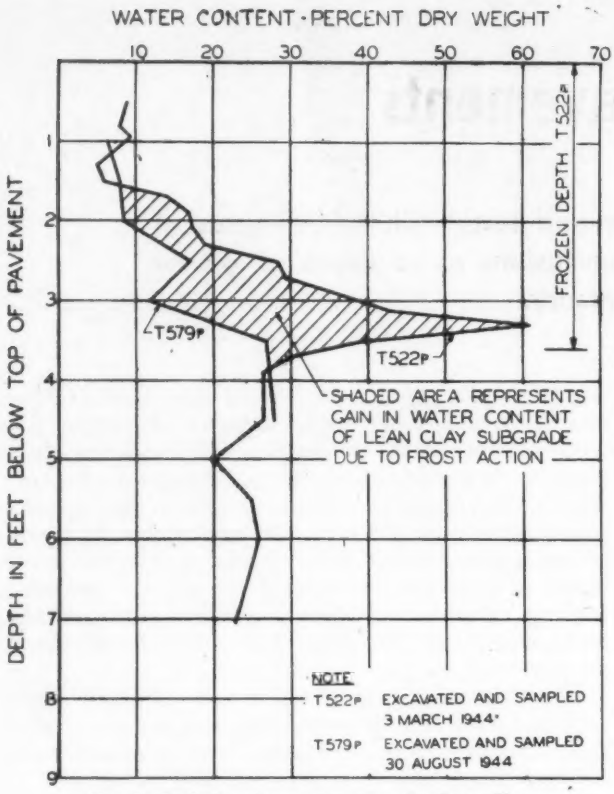


Fig. 3—Typical water content vs. depth profile.

Three different pavement constructions were tested: (a) a 7-inch non-reinforced concrete pavement with about 15 inches of gravel base, constructed partly upon a lean clay and partly upon a silty till subgrade; (b) a 4-inch plant-mix bituminous concrete pavement with about an 18-inch gravel base, constructed largely upon a lean clay with limited areas of silty till subgrade; (c) a 4-inch plant-mix bituminous concrete pavement with a 3-ft. gravel base constructed upon a lean clay subgrade. In all test areas, ground water was at or very close to the bottom of the gravel base.

The silty till is a well-graded, compact, slightly plastic soil whose particles are generally sub-angular and vary in size from about 6″ to a finer than .001 mm, with a CBR of 60 in one test and 120 in another. The lean clay consists of a lean to moderately plastic clay which is highly weathered at the top, with many minute fissures and pockets,and with a CBR of 5 to 16, averaging 10, reduced to 4 immediately after the thaw.

The maximum frost penetration during the winter averaged four feet. Heaving of pavements ranged from about 0 feet in the thick gravel base areas to 0.6 feet in the areas of thinnest base. Ice lenses were observed to be thin and widely spaced in the subgrade immediately beneath the base, becoming thicker and closely spaced at the maximum depth of frost penetration.

During the frost-melting period, one pavement failed under traffic and two pavements showed definite indications of distress, traffic on one being stopped before failure was reached.

The temperatures during the test are shown by the curve in Fig. 2. Degree-days below freezing is the cumulative difference for each day, between 32° and the average, of the maximum and minimum temperature that day. The maximum ordinate of the curve is designated the "freezing index."

During the winter, observations made by test pits showed ice lenses in the lean clay to be generally thin and relatively widely spaced at the top of the subgrade, becoming thicker and closely spaced at the frost line. Water content, including both soil and ice, increased from about 25% at the top to about 35% at the frost line, below which it dropped immediately to 24%.

The flexible pavement consisted of a two-course, hot plant-mix bituminous concrete with gravel and sand aggregate, the total thickness averaging 3.5 to 4.0 inches. The base course is a bank-run, well graded sand and gravel, containing a fairly large percentage of silt and a small proportion of soft particles; the depth varying from 17.5″ to 37″.

In making the test on each of 15 areas, from 4 to 44 coverages were made per day for ten days. After a night's rest the pavement did not flux as much as at the end of the previous day. There was permanent deformation of the pavement surface ranging from 0 up to 0.4 inch in the portions that did not fail.

Fig. 4 shows failure of an area where the total thickness of pavement and base averaged 18″, ranging between 14″ and 22″; on a lean clay subgrade; heaving of pavement, 0.6″ to 2.5″; 4 to 26 coverages per day of 20,000 lb. wheel loads. Fig. 5 shows an area with total thickness of pavement and base of 21″ average, ranging from 20″ to 22″; on silty till subgrade; heaving of pavement averaged 3.5″, ranging from 2.5″ to 4.0″; 4 to 50 coverages per day of 20,000 lb. wheel loads. Of fifteen areas tested, only four failed; these were all under 23″ total thickness of pavement and base, and only one under this thickness did not fail.

Summary of Pavement Heaving Observations

From these tests it was concluded that:

(a) For traffic of 4 coverages per day, 24 inches of flexible pavement and base on lean clay subgrade, with two feet of subgrade subjected to severe frost action, is adequate pavement and base to withstand a 10,000 pound wheel load; and 18 inches is inadequate to withstand a 15,000 to 20,000 pound wheel load during and immediately following the frost melting period.

(b) For traffic of 4 coverages per day, 21 inches of flexible pavement and base on a silty till subgrade, with two feet of subgrade subjected to severe frost action, is adequate to withstand a 15,000 to 20,000 pound wheel load.

(c) For traffic of 40 coverages per day, 24 inches of flexible pavement and base on lean clay subgrade, with two feet of subgrade subjected to severe frost action, is inadequate to withstand a 7,000 to 10,000

(Continued on page 46)

Fig. 5—Pavement on silty till subgrade after failure.

Bridge Records of Florida's State Road Department

Data on all structures above 20-foot span on state maintained roads are recorded and periodically kept up to date. Maintenance costs are recorded. Bridge index by counties is found helpful in rerouting traffic.

By WALTER M. PARKER

Head of Division of Research and Records, State Road Department of Florida

In Public Works *for August we described a system used for keeping records of bridges and culverts of Thomas County, Kansas. The following article, which appeared in the "Highway Magazine" (published by Armco Drainage Products Association), describes how such records are kept by the Florida State Road Department.*

SYSTEMATIC keeping of records of all bridges on the state maintained roads in Florida for the past five years has been worthwhile in several ways. It gives a true picture of the condition and safety of these structures, and it gives valuable data on the performance of various types of structures. It also aids in planning bridge improvement programs.

All structures with a total clear span of 20 feet or more along the center line of the road are included, on both rural and urban roads. Timber structures, regardless of width of clear openings, if they utilize the natural streambed, are also included. For, although it is the general practice in engineering circles to class structures of less than 20-foot clear openings with culverts, the fact remains that any timber structure, regardless of length, is a critical location on the well traveled highway and as such does, in our opinion, warrant consideration along with bridges of longer length. Timber structures are one of our problems and we want to know all about them at all times.

Bridges are classified according to seven types of materials or combinations of materials: timber, steel, concrete, timber-steel, timber-concrete, steel-concrete, and timber-steel-concrete. Structures of a predominant general material are included in one of the first three groups.

Forms Used

All information is recorded or kept on the following forms:

RR 33—Office Record
RR 33 (Field)—Field Record
RR 33-A—Photographic Record
RR 1-B and 11-B—Compilation of Structure Lengths
591—Inspection Report or Bridge Capacity Survey
RR 1021—Construction, Condition and Improvement Record
Index—by Counties
Recapitulation—by Divisions

(Continued on page 46)

FORM R. R. 33

STATE ROAD DEPARTMENT OF FLORIDA
DIVISION OF RESEARCH AND RECORDS
IN COOPERATION WITH UNITED STATES PUBLIC ROADS ADMINISTRATION
BRIDGE RECORD

Compiled By	G.W.W.
Checked By	C.C.W.
Approved By	
80. Bridge Control Number	3
Division No.	1
Inventory Date	10-41
Previous File No.	

GENERAL DESCRIPTION		CODE
1 Road System	SR FA, US, -	1 1 1 0
2 County	Hillsborough	2 9
3 Identification No.	121	1 2 1 0
4 U. S. Route No.	41	0 4 1
5 State Road No. (Old)	5	0 0 5 0
6 State Road No. (New)	-	x
7 Plus at Beginning	4.8	0 4 8
8 Kind of Bridge	O.D.	0 4
9 Bridge Number		
10 Month and Year Began	7-23	
11 Month and Year Comp.	2-24	2 4
12 Name of Stream	Hillsborough Riv.	
13 Name of Railroad		
14 No. of Roadways	2	
15 Project No. (Old)	SP - 583	
16 Project No. (New)	6089	
17 Substructure Material	C	2
18 Superstructure "	C	2
19 Sub-Floor "	C	2
20 Roadway Floor "	ST	6
CONDITION	% Dep.	
21 Substructure	G 0	
22 Superstructure	G 0	
23 Sub-Floor	G 0	
24 Rdwy. Floor	G 0	
25 General	G	1
26 Inspector and Date Hansen	5-44	

DESIGN AND CONSTRUCTION		CODE
27 Type of Bridge	Conc. I. S & Beam	3 2
28 Rating 30000 Design LL	Posted LL	1 5
29 Total Length	175	0 0 1 7 5
30 Width (Rdwy) Min. & Max.	30-30	3 0 3 0
31 No. of Spans	4	
32 Maximum Span Length	43	
33 Type of Draw	-	
34 Length of Draw	-	
35 No. of Sidewalks	2	
36 Width of Sidewalks	5	
37 Length of Timber	-	x
38 Length of Concrete	175	0 0 1 75
39 Length of Steel	-	x
40 " " Combination	-	x
41 Vertical Clearance	U	
42 Hor. Clear. Min. & Max.	40-40	
GENERAL		
43 Ht. Above Stream Bed	24	
44 Clear. Above High Water	15	
45 Is Stream Navigable	No	
46 Will Waterway Stand Flood	Yes	
47		
COST		
48 Construction Cost 62085 2088	64173	
49 Salvage Amount	-	
50 S. R. D. Payment		0 0 6 4 1 73
51 Total Cost		0 0 6 4 1 73

PAYMENTS MADE BY	
52 Federal Government	
53 County	
54 City	
55 R. R. Company	
56 W. P. A.	
57 P. W. A.	
58 Private	
59 State	6 41 73
60 Total	6 4 1 73
CONTRACTOR	
61	Robert Mugee Co.
DESIGNED BY	
62	
PLANS	
63	
RETIREMENT	
64 Date	Replaced By
65 Reference	
66 Loss	
67 Salvage	

YR. OF REC.	PROJ. NO.	I. D. NO.	BRIDGE NO.	LOAD CAPACITY	ROADWAY WIDTH	CLASSIFICATION	Timb. / Conc.	Steel / Comb.	FILE NO.	Co.	S. R. No.	Sta.
1940	1004	121	1	15	40		Conc. 12			29	5	4.8

Bridge record as made out for a concrete bridge.

Developing Additiona

By JOHN W. PRAY
Manager of Utilities, Fort Dodge, Iowa

Weir box at well No. 4 measuring flow of 2,900 gpm from air lift.

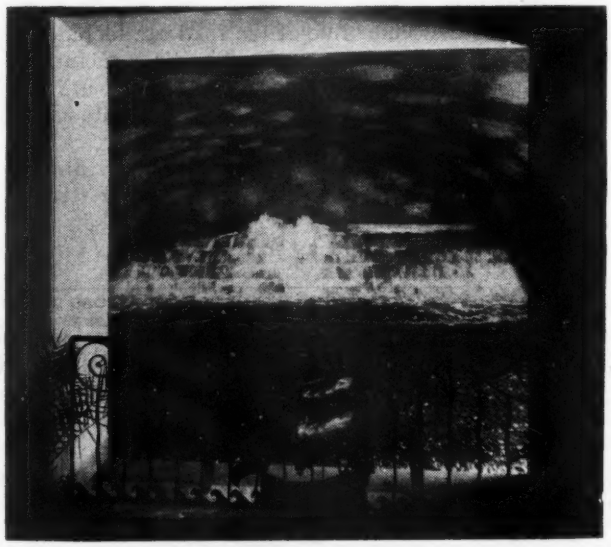
FORT DODGE, IOWA, has owned and operated its water works since 1881, when the system was started by the city. The original supply was an infiltration system in the Des Moines river. From 1908 to 1919 the supply was a combination of river water and ground water from wells. Since 1919 the entire supply has been obtained from wells.

Water from the wells contains from 1.5 to 2.5 ppm of iron, and in 1930 an aeration and filtration plant was installed, which reduces the iron to a trace only. The total hardness is 33.8 gr. and water softening may be added in the future.

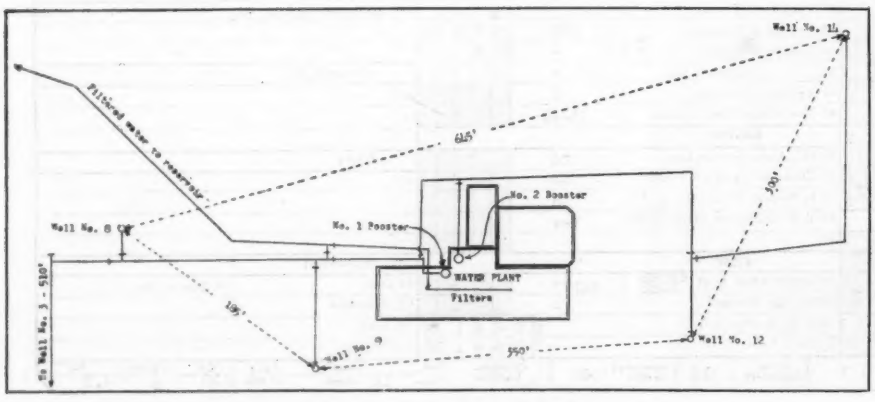
The present population is 23,000 and there are now 5,400 consumers. The average daily pumpage during the year ending April 1, 1945, was 2,750,000 gal.; maximum day, 4,794,166 gal. The consumption in July, 1945, was running close to 4 mgd; 1½ mgd going to one consumer, a packing company. More than 0.5 mgd is used for 25 systems of air conditioning, for which our water is very satisfactory, having a temperature of 52° F at the plant and 55° to 60° throughout the business section. But they make a very unsatisfactory load on the plant, as they always come on during the highest peaks and are operated for only a few weeks during the summer. The cost of preparing for this service is far out of line with the receipts from the sale of the water, it is a big drain on the ground-water supply, and the writer is very much interested in having limits placed on the amount of water used for this purpose.

At intervals from 1908 to 1935 fourteen wells have been drilled to different depths, of which Nos. 3, 8, 9, 12 and 14 are in use at the present time. Each of these flowed at the surface when completed. When well No. 1 was completed in 1908 the static water level was approximately 60 ft. above ground level; but when No. 14 was completed in 1935 it had lowered to 18.5 ft.

Well No. 3 was drilled to a depth of 215 ft.; No. 8 to 1432 ft.; No. 9 to 555 ft.; No. 12 to 541 ft., and No. 14 to 930 ft. It was not originally known whether there was appreciable interference between wells tapping different veins. The recovery of the water level to about the same elevation in each well indicates that probably all of the aquifers are connected. There is good geologic evidence pointing to the probability of the existence of a high angle fault or faults



View of indoor aerator.



Map of well field and location of water plant.

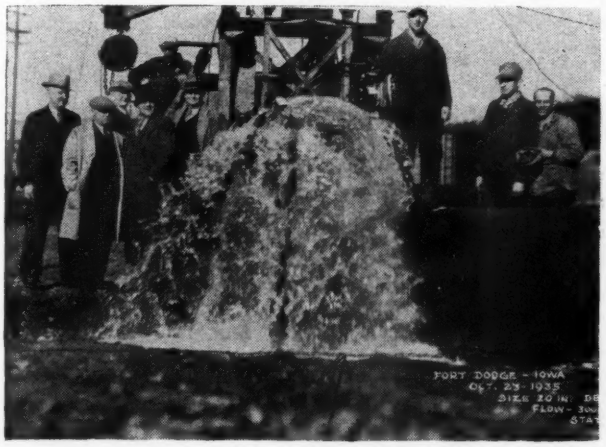
which would explain the connections between the various aquifers. Some measure of the interference between wells was obtained during the testing program, to be described.

In 1919 air-lift pumps were installed in some of the wells and were used to increase the natural flow when this was necessary. In 1932 well No. 12 was drilled, and in 1935 well No. 14, which so increased the supply that pumping was unnecessary until the summer of 1944, when it became apparent that a fur-

Ground Water at Fort Dodge

As ground water level fell, natural flow of wells decreased. Potential flow of well field was investigated and adequate supply obtained by installing deep-well pumps.

John W. Pray



Flow of 3,000 gpm from 20" well in 1935. Static head, 19 ft.

ther increase would be necessary in the near future, as peak days were running well over 4.5 mgd. which was just about the limit of production under the set-up at that time.

As stated above, none of the wells had been pumped for a number of years and the two best ones had never been pumped. They all flow into a common line, which carries the water to one of two booster pumps which are used to raise the water twenty feet over an inside aerator.

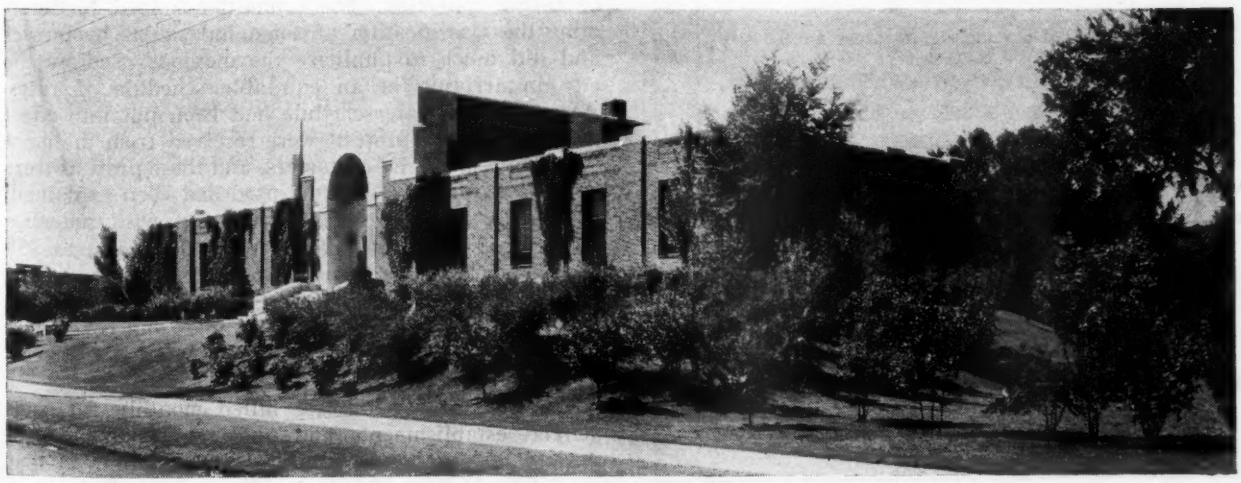
For several years the writer had had in mind a plan to recommend when there was apparent need for it, and that time seemed to be here during the summer of 1944. It will be noted by the enclosed sketch that the plant is set right in the middle of the well field and, in our opinion, that field had been pretty well developed so far as additional wells were concerned; though the unusual underground conditions existing at this location make it uncertain just what will be found a short distance from an existing well where conditions are known.

It was recommended and approved that a careful check be made of the two larger wells, Nos. 12 and 14; the natural flow to be measured and flows at various drawdowns, meanwhile checking the head and flow of all other wells. A representative of the Iowa Federal Geological Survey was present and took part in the tests and I believe the information produced will be very valuable in aiding our department to decide whether or not to drill more wells in the area or develop locations further removed from the plant.

In October, 1944, work on these tests was started on well No. 12. This well in 1932 had a natural flow of 1200 gpm but at the time of the test this flow had reduced to 400 gpm. A temporary air-lift pump was installed and, by drawing the head down 26′, the flow was increased to 1600 gpm. This was carried on for days without any falling off in production. A turbine pump was installed permanently and is ready to run when needed, the natural flow passing through the pump when it is not in operation.

The well rig was then set up over well No. 14, and this was thoroughly cleaned out and tested for natural flow and static pressure. Then 180′ of 12″ extra-heavy steel pipe and the same length of 2½″ extra-heavy air line were hung in the well for a per-

(Continued on page 38)



Fort Dodge Waterworks pumping station.

Sanitary Fill on the Island of Efate

By clever adaptation of the sanitary fill principle, a highly unsanitary garbage dump on the island of Efate, New Hebrides, has been converted into a sanitary fill. An open dump area between a lagoon and the main road into the town of Vila was unsightly and hazardous. Flies and mosquitoes swarmed about this area, and a night survey showed nearly a thousand rats on the dump. American troop units were on duty within a short distance of the area. The site was not the most favorable for a sanitary fill, as there was a sharp slope from the road to the edge of the lagoon, and underneath the six inches of top soil was a hard coral.

In developing the sanitary fill, the whole dump area was covered with from 6 to 8 inches of coral aggregate and sand, to retain which a 30 per cent slope was formed on three sides. On the top edge of the slope, sand and coral aggregate were piled in a mound 5 to 7 feet high around three sides, thus holding intact any lateral thrust that the debris might make. The sand and coral were obtained from stock piles on the site which were built up once a month. Dumping was started at a point on the upper slope so that when the fill was built out level it met the top of the sand mound. A coating of oil is put on top of the garbage and 6 to 8 inches of coral and sand on top of the oil seal. At the end of the day all the garbage, including sloping sides of refuse, would be covered in this way.

A place was maintained on the site for burning boxes and cardboard, which, however, was kept at a minimum by requiring all units in the area to have an incinerator and to take only non-burnable material to the sanitary fill. Some units, however, took burnable material to the sanitary fill site for burning.

The settling of the fill was slight. Most of the cans were flattened and bottles broken before arriving at the sanitary fill. Broken glass bottles were used to fill the voids in the can pile and edible garbage sometimes was used to fill voids in the broken glass. The oil seal and 6 to 8 inches of sand and coral were placed on top of this fill. Dumping was started at a point on the upper slope so that when the fill was built out level it met the top of the sand mound. A crew of eight natives and one soldier with wheelbarrows and tools maintained the sanitary fill.

This adaptation of the sanitary fill principle varied from the conventional procedures in that (1) sloping terrain was used instead of relatively level terrain; this instance, however, eliminated a need for excavation but necessitated hauling in material for coverage which ordinarily is obtained from excavation dirt; (2) 6 to 8 inches of sand and coral were used for coverage daily instead of 2 feet or more of earth; (3) garbage was covered daily with oil.

This sanitary fill eliminated the mosquitoes and rats, flies were reduced to a minimum, and the appearance of the site along the road into town was greatly improved.—From the Bulletin of the U. S. Army Medical Dept.

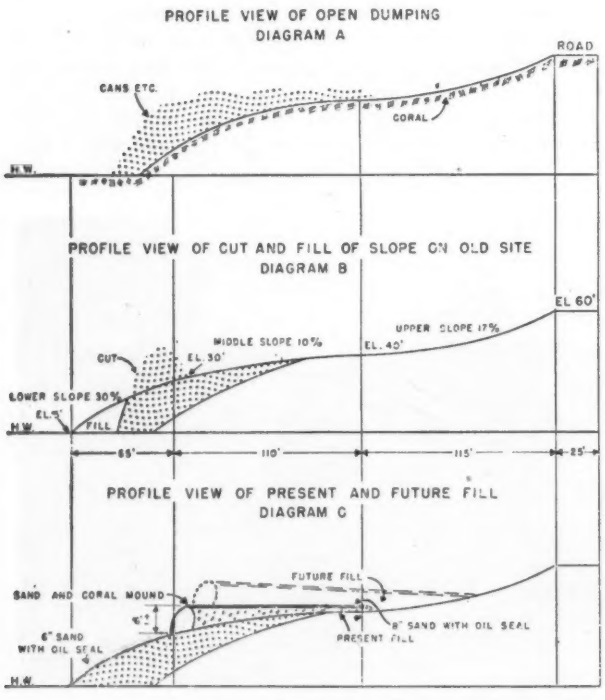


Diagram showing development of sanitary fill on the Island of Efate.

A Study of Rates for Refuse Collection

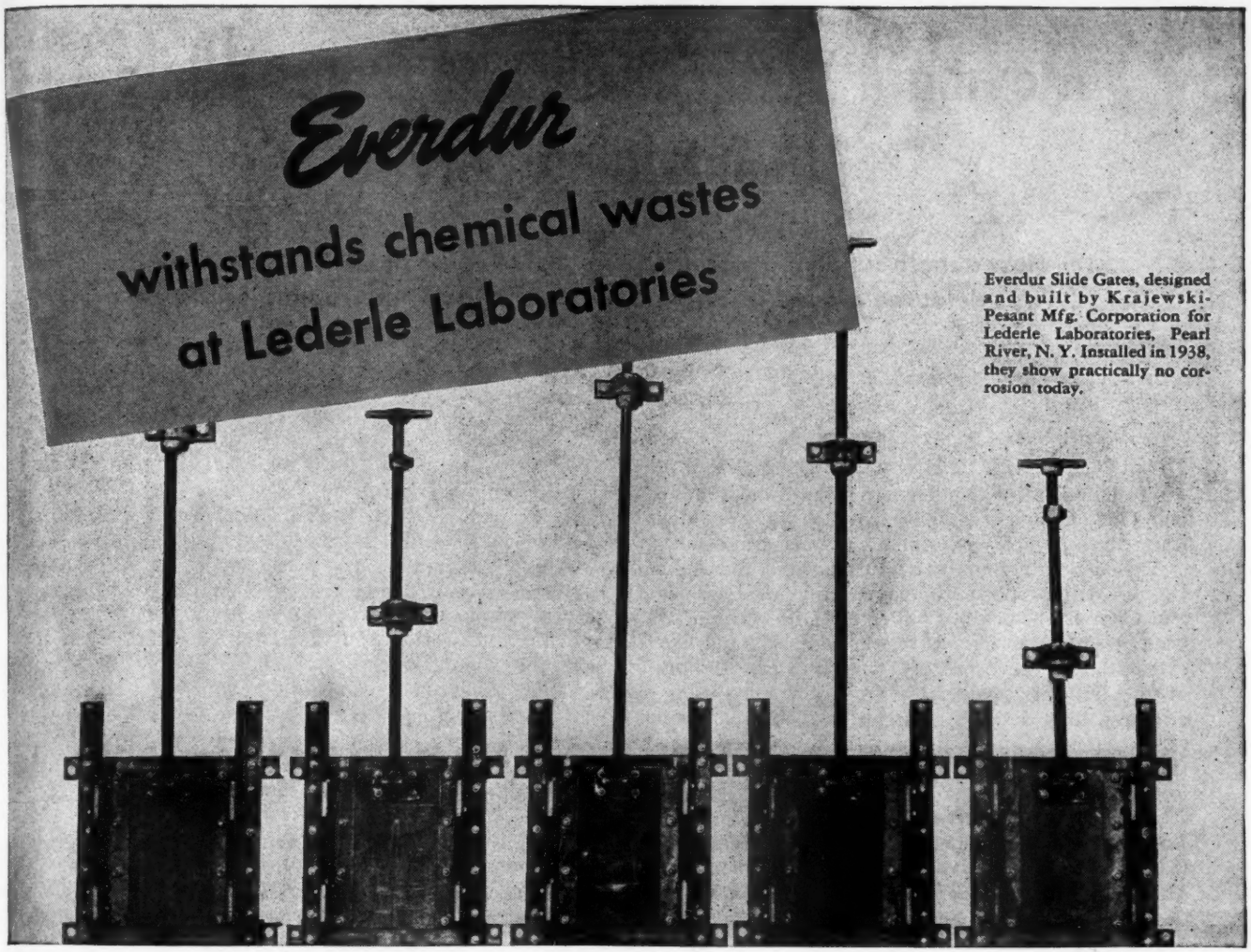
Greensburg, Pa. (population about 17,000), adopted service charges for refuse collection about ten years ago. Finding that the rates charged for this needed revising, because of both inequalities and insufficient revenue (in 1943 the revenue was 30% less than the cost of the service), the city council made a thorough study of the subject with a view to increasing the rates to cover the cost of the service, and to determining a fair basis for apportioning them.

Field studies conducted at different seasons of the year indicated that 65% of the cost should be paid by residences and 35% by commercial establishments. Dividing the 65% by the number of residences served gave the average cost, which was adjusted slightly to allow for the difference in time required for collecting from single residences and from multiple dwelling units, respectively. This gave monthly charges per family for garbage and rubbish removal as follows: Single houses and duplexes, $1.00; apartments of from three to eight units, 80 cents; apartments with more than eight units, 65 cents. Similar charges are made for ash collection.

All the commercial establishments were grouped into 16 classifications and a tentative schedule of charges set up. This was reviewed by a citizens' committee composed of a department store executive, a clothing store manager, a garage owner, an office building manager, a grocer, and the superintendent of refuse collection. The committee helped to determine the classification of some individual businesses and did much to publicize the methods used by the city in arriving at an equitable schedule of rates. After the new rate schedule had been put into effect only three minor protests were received from the more than 250 commercial customers, and these protests were withdrawn when the method used had been explained.

Monthly charges for hotels varied with the size, from $2.50 for those of less than 20 rooms, to $54 for those with more than 150 rooms. Rates for supermarkets were $37, and for neighborhood grocery stores, $1.75 to $4. These are samples and cover garbage and rubbish only; separate rates are set for collecting ashes.

Charges for services are billed monthly for commercial establishments and quarterly for residences through a postal card billing system similar to that used by public utilities. A 20 per cent discount is allowed for payment three months in advance.



Everdur Slide Gates, designed and built by Krajewski-Pesant Mfg. Corporation for Lederle Laboratories, Pearl River, N. Y. Installed in 1938, they show practically no corrosion today.

OUTSTANDING as a producer of vaccines, serums, and other biologicals are the Lederle Laboratories of Pearl River, New York. War demand for blood plasma and later for penicillin resulted in tremendous enlargement of both plant and personnel.

Constant cleanliness and uninterrupted sanitation facilities are essential in maintaining the sterility of such products. Here, sewage equipment installed before the war must function efficiently, regardless of the increased volume, varying chemical nature, and fermentation of the wastes handled.

Everdur*—the copper silicon alloy—in the slide gates, screens, weir plates and other mechanical equipment of the sewage system, has again completely solved the problem of corrosion resistance under difficult conditions. From the Lederle Laboratories comes the statement that the Everdur parts serve "—in sewage which probably contains a greater variety of chemicals than is usually encountered in Sewage Treatment Plants, and they show *practically no corrosion yet*. We consider them very excellent for the purpose."

Rust-proof and corrosion resistant, Everdur has the strength of mild steel, and thus makes lightweight construction practicable. Made in nearly all commercial forms. Everdur is readily fabricated and welded. And with all these advantages, it is moderate in cost. 45181

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Moving a Water Main and Meter While Maintaining Service

How a main supplying an entire village, including the main line meter, was detoured around its original location without interrupting service.

By C. M. ABBITT
City Engineer, Roxboro, N. C.

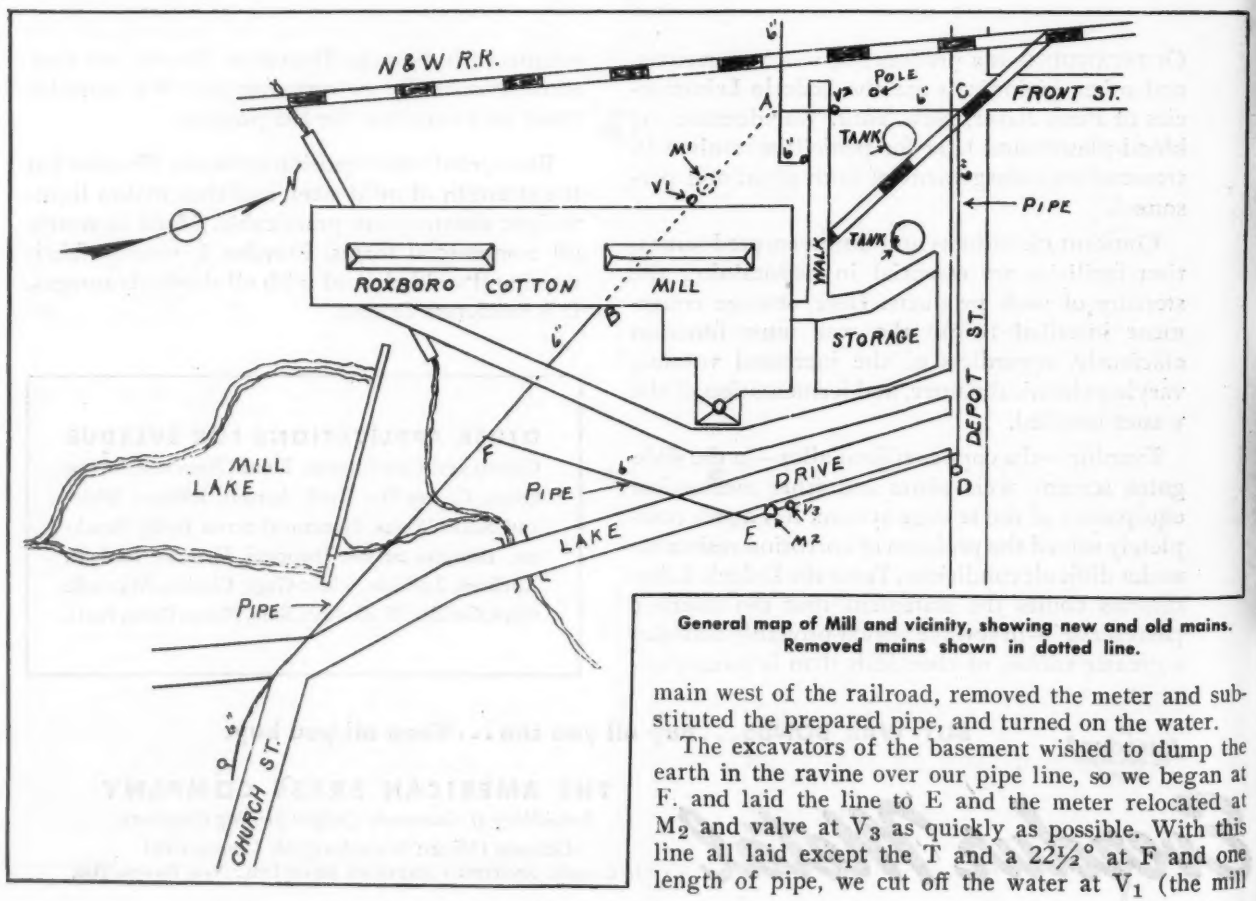
ROXBORO, N. C., a city of 5,000, serves four other communities with its water supply and sewer system. One of these is East Roxboro, to which we deliver water through a 6″ main and a 6″ meter in same.

This 6″ main had been laid through the Roxboro Cotton Mill property to the junction of Lake Drive and Church St., passing under the mill building. Last year the mill was busy with war contracts and needed extra storage space quickly; and because of shortage of the building material necessary for building an addition, they decided to dig a large basement under three-fourths of the building. As the water main referred to interfered with this, we decided to move it to a new location.

As shown in the accompanying plan, the main from Roxboro crosses east under the N. & W. R. R. tracks to A, where there was a T and a 45° bend which directed the line SE across the property. At M, was a 6″ Tropic compound meter; just beyond this a 2″ service pipe for the mill (see cross-section), and just outside the mill wall a 6″ valve, V_1. The mill service passed east under the machine floor, supplying cooling water for two air compressors, humidifiers, toilets and drinking fountains. The village supply was controlled by the valve V_1, from which the main crossed the basement, under the roadway and a ravine below the dam, to the intersection of Lake Drive and Church St. and on into the village.

The 6″ main was re-routed from A, north to C, east to D, south to E and southwest to the original location at F. The meter and 6″ valves had to be set in the new line, and all the work done with the least possible interference with service to either village or mill.

A piece of 6″ pipe was prepared the exact length of the meter, and late on Saturday afternoon I had the mill mechanic stand by with a small reserve of water for his machines; then closed V_1 and a valve on the main west of the railroad, removed the meter and substituted the prepared pipe, and turned on the water.



General map of Mill and vicinity, showing new and old mains. Removed mains shown in dotted line.

The excavators of the basement wished to dump the earth in the ravine over our pipe line, so we began at F. and laid the line to E and the meter relocated at M_2 and valve at V_3 as quickly as possible. With this line all laid except the T and a 22½° at F and one length of pipe, we cut off the water at V_1 (the mill

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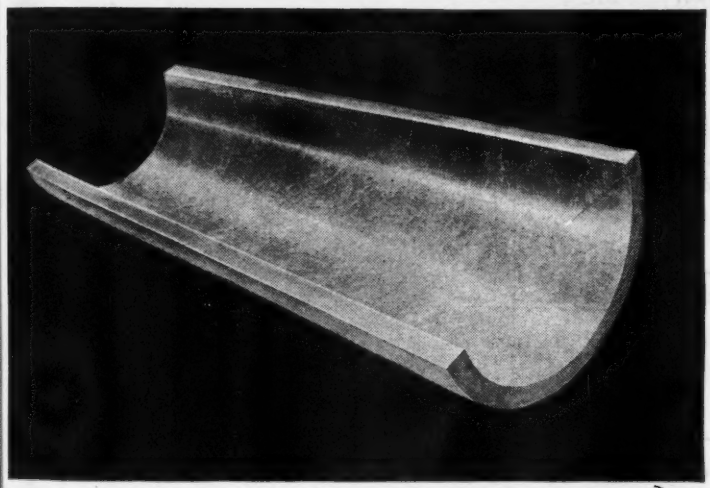

low operating costs

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could continue to get service then), cut out pipe in the main to insert the T; and when T, elbow and first joint of pipe were in place, we leaded all the joints and opened V_1, thus letting water flow through to the village and the new pipe to V_3.

Beginning at V_3 we laid Glamorgan bell and spigot pipe up to Depot St., where another tee was placed so that a fire hydrant could be placed at D. Now, with traffic heavy on Lake Drive and roadway next to the mill, we were forced to put in half the roadway at a time. Then we had a straight way to the Norfolk & Western side track, which we tunneled under, then to C in Depot St. where we placed a 90 deg. elbow and headed south to A.

From C to A was no picnic. Starting at C, we worked our way between tank and flagpole foundations, under other pipe lines, walks and drains. At V_2 we put in a new 6″ gate valve. Closing V_2 and opening V_3 we had the water back to the west side of the mill. The pipes were laid and the last joint was cut to fit in when the tee at A would be turned from south to north.

The mill mechanic was asked to draw a small reserve of water and stand by while we shut off the city water. Then we burned out the 45 deg. elbow in bell of the tee at A. After heating the bell and spigot ends of the tee in the line, we put a timber in the side opening and turned the tee over one-half, at the same time putting the cut joint in the hub where the 45 deg. elbow at A had been removed. Then we poured the final three joints and repoured the two ends of the tee. Now, the city water was cut on again, V_2 was opened and V_3 closed. Quickly we went in the basement and burned out a joint near B and leaded a cast-iron plug into the bell. This plug had a 2″ opening into which we had screwed a 2″ nipple with a 2″ gate valve on the end.

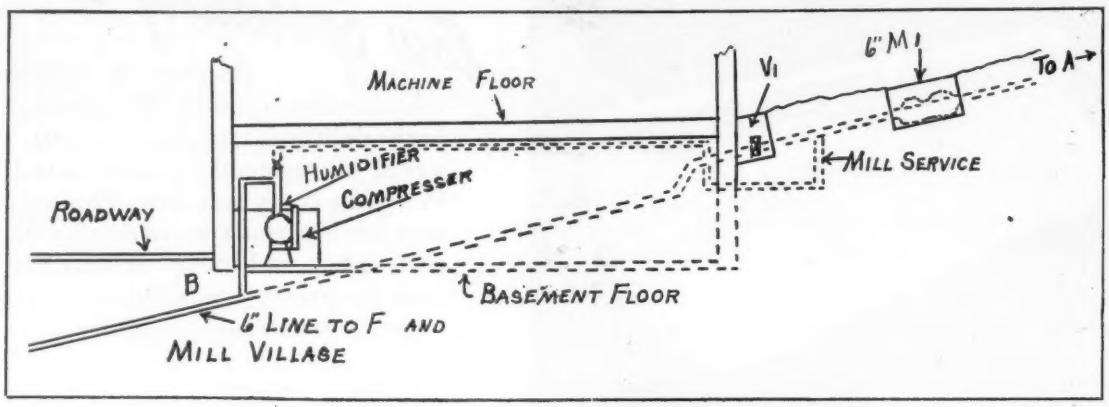
The mill mechanics had their pipe ready with just a union to be put on and tightened. While we were caulking the 6″ plug the water was being cut on at V_3. Someone closed the 2″ gate valve at the tee between V_1 and M_1 and we opened the 2″ valve at the plug near B. Now, we have the water flowing from A, C, D, E, F and to B to serve the mill. The pipe from the burned out joint at B to V_1, M_1 to 45 deg. elbow at A was dismantled and salvaged. All ditches were filled and a brick box with cast-iron top was built around the meter at M_2. This job was carried out without interrupting the mill schedule for one minute. I acknowledge the cooperation of the mill mechanics in helping us to change the cut-in so quickly.

Patents and Mechanical Equipment in Sewage Treatment

The extent to which patents influence the design of sewage treatment works is increasing. In a recent design of a sewage treatment plant for a large eastern city the patent situation was canvassed very carefully. A thirteen-page memorandum covering the patent aspects of the design was prepared for the client's attorneys.

The majority of the patents dealing with various sewage treatment processes are held or controlled by the manufacturers of mechanical equipment. In general the fee for the use of the patent is nominal and is included by the manufacturer in the cost of the equipment. Not all the manufacturers are licensed under all the patents. The effect of this condition is to restrict the designer somewhat in his choice of equipment and structures and to restrict competition in the purchase of equipment.

Another type of patent is the kind held or controlled by an individual. This patent covers an entire process of sewage treatment. Such processes are not usually proven ones but are more of the nature of untried sales promotional devices and should be used warily with adequate performance guarantees or not at all.



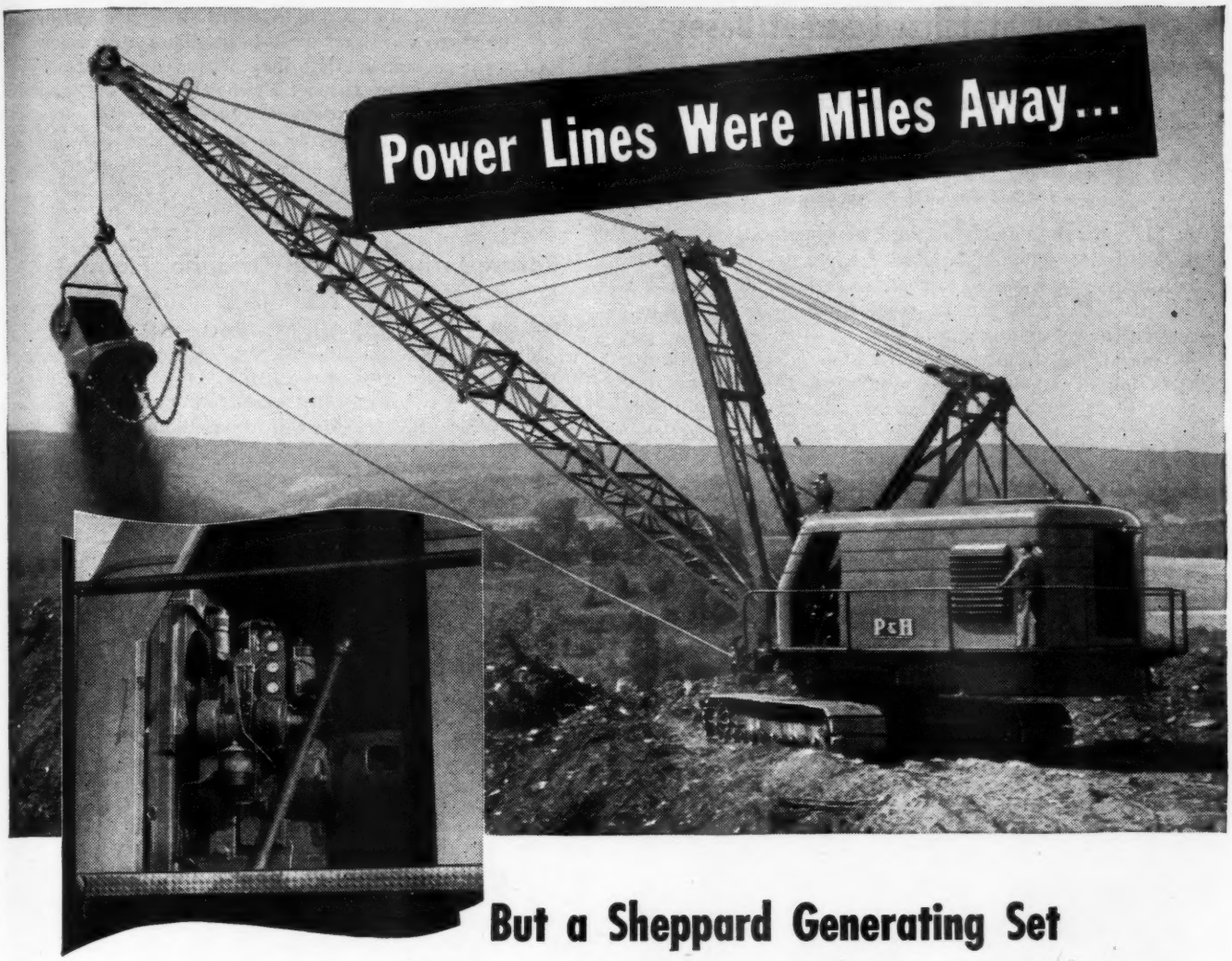
Cross-section of Roxboro Cotton Mill, showing original location of piping. Dotted lines indicate pipe removed.

It is probable that the use of mechanical equipment at sewage treatment plants will continue to increase for several reasons. First, because better and more durable equipment is being manufactured; second, because the increased use of good and well adapted equipment lessens hard and disagreeable labor around a sewage treatment plant; third, because of the desirability of providing more convenience and more labor saving devices.

It will be interesting to see whether or not the increased production capacity of the aluminum industry will find more aluminum used in underwater mechanisms, subway gratings, weir plates, shear and sluice gates, and for other similar uses where it is difficult to keep the metals now used for these purposes painted. —From a paper by Kenneth V. Hill before the South Dakota Water and Sewage Works Conference.

Financing a Sandpit

Richfield, Minnesota, last year purchased a sandpit for a cost not exceeding what it had paid annually for sand and gravel. Recently they accepted a bid for a cable-line scoop shovel and tractor at $4,917, which "will be paid for out of the profits from the liquor store."



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THE Colitz Coal Company, Inc. of Pottsville, Pa., operates a strip mine far from commercial power lines. But Colitz not only obtains *dependable* power . . . it obtains it at a *saving* with a Model 7 Sheppard Diesel Generating Set.

This generating set supplies lights and auxiliary power in and around the dragline shown above. It operates 14 hours a day . . . *yet it has never cost Colitz one cent for major repairs or maintenance.*

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Tar-Soil Stabilized Street Bases

Present Condition of Streets After Seven Years of Service

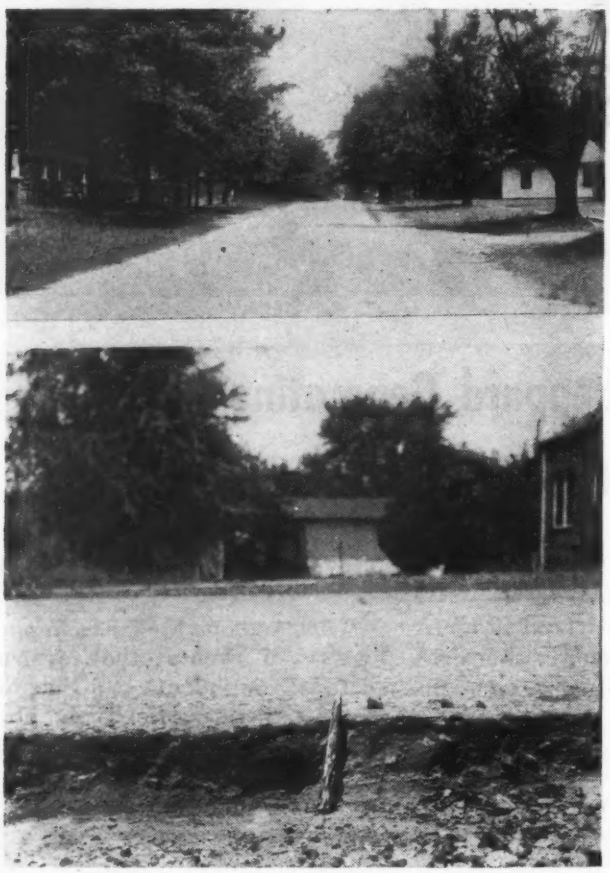
By GEO. E. MARTIN

Consulting Engineer, The Barrett Division
Allied Chemical & Dye Corp.

NEW paving materials and new methods of using old materials must be subjected to the test of time before they can be considered successful. Seven years ago the use of tar for base stabilization was more or less in the experimental stage.

One of the early base stabilization jobs was the construction of about 40,000 square yards of streets in the city of Albertville, Alabama, during the summer of 1938. This work was fully described in an article by the late C. H. Olmstead in the March, 1939, issue of PUBLIC WORKS.

The following brief description of the work is taken from the heading of the article: "Streets without any



Tar-soil stabilized streets seven years old.

previous roadway improvement were surfaced in Albertville, Alabama, by mixing tar with the soil present, using a concrete mixer for some, road mix for other streets, to make a base 4" thick, which was covered with a tar surface treatment. Good, low-cost results were obtained on 40,000 square yards."

These Albertville streets were inspected recently and found to be in excellent condition. The tar-soil bases were hard, firm, and water-resistant. The tar has continued to function as well or better than it did when first mixed with the soil. One additional seal coat was applied to the surface as maintenance during the seven years the streets have been used since the original stabilization job.

There is every indication that the bases are better now than when they were first built. Therefore there is no reason to believe that they will disintegrate at any time in the near future. Evidently they are just as permanent as more expensive types.

The experience of Albertville proves that satisfactory, long-lived tar-soil bases for city streets can be built easily and at low cost.

Refuse Incineration at Orlando, Florida

Orlando, Florida, in 1943 constructed a refuse incineration plant guaranteed to dispose of 350 tons of mixed garbage and rubbish in 24 hours, to dispose of its own refuse and that of the Army Air Corps base, which was being constructed on land on which had been located the city's former incinerator and which had been purchased by the Army. The new incinerator was partly paid for by a grant from the Federal Works Agency.

The plant consisted of two Nichols "Monohearth" mechanically stoked incinerators with individual ash hoppers, combustion chambers, air preheaters, flues, ducts, fans, and a stack; and a waste-heat boiler for utilizing the hot gases from the combustion chamber. The plans called for a large concrete receiving bin, from which the refuse would be removed for charging the incinerators by means of a traveling crane. However, the crane was unobtainable because of war conditions and the receiving bin was covered with heavy planking level with the charging floor, as a temporary measure, and the refuse was either dumped directly into the charging holes or upon the floor, to be pushed into the charging holes as needed.

This type of incinerator (which was then a new one) consists of a cylindrical wall of refractory material, which, with its insulation, is encased in a steel shell 15 ft. 9⅜ in. in diameter. It is covered with a domed roof, in the center of which is the charging hole; the spring line of the roof being 14 ft. above the operating floor and 11 ft. above the grate.

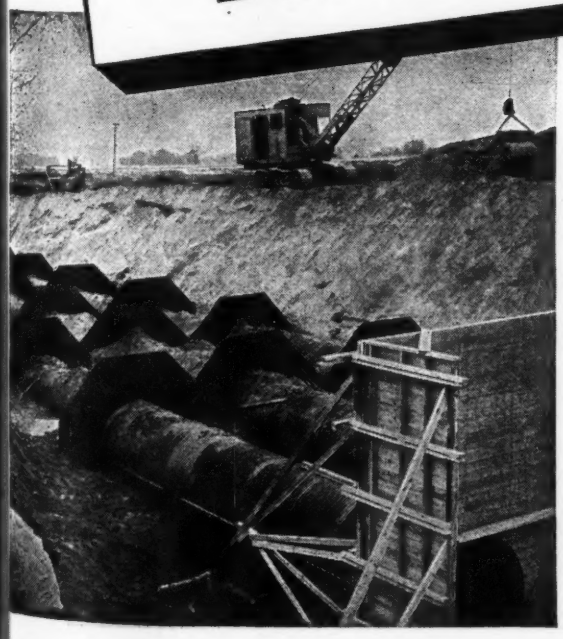
The refuse drops onto a cone-shaped hearth about 10 ft. in diameter and with a 60° angle at the peak; around which is an annular grate between the hearth and the side wall, divided into separate dumping sections, from which the ash falls into a water-quenched ash hopper. Two arms, which act as stokers, are bolted to the cone, which revolves at about four revolutions per hour, the arms gently lifting the refuse eight times an hour and pushing it forward and outward toward the grate, where final burning takes place. The rate at which the refuse is pushed onto the grate can be regulated by adjusting the position of the cone arms.

The cone and arms are of heat-resisting alloy and are supported from below by a vertical, hollow, cast-iron shaft. They are cooled by the passage through them of the combustion air, supplied by a fan at a controllable rate; this air passing into the central mass of refuse through numerous holes in the cone and through the arms, which it thus cools. Heat exchangers preheat the air for combustion. Part of the exhaust gases from the preheaters are utilized to produce steam in a two-drum boiler capable of delivering 4,000 lb. of steam per hr. at 125 lb. pressure. This steam is used for winter heating, cooking, sterilizing and laundering at the adjoining prison farm.

In an official test on October 6, 1943, fire was started at 8:30 A.M., the last charge fed at 5:10 P.M., and the furnace burned down at 5:30, giving a total burning time of 9 hours. During this time

These Gates STOP Backwater

Installing three Model 30-05C Hardesty water control gates on a mid-Western levee. They were designed for a differential head of 25 feet. Each gate is attached to 250 feet of 72-inch ARMCO Paved Invert (bituminous-coated) Pipe with watertight couplings and nine corrugated diaphragms as shown in the lower photograph.



Levee openings for tributary streams and sewer outfalls need protection against high backwater from the main streams.

Calco-Hardesty Gates eliminate this hazard. They provide free outflow with quick, positive action to prevent backflow. These rugged gates are easily attached to ARMCO corrugated pipe or can be adapted to any type of drainage structure.

There are various types of Calco-Hardesty gates — flap, slide and radial — from 8-inch diameter to 84 inches and larger. Write for free catalog. Armco Drainage Products Association, 645 Curtis Street, Middletown, Ohio.

ARMCO

CALCO-HARDESTY GATES

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 75-77*

158,852 lbs. of garbage and 22,900 lbs. of rubbish were burned, a total of 90.9 tons. This was 138% of the rated capacity. The average combustion chamber temperature was 1520° F. The residue removed was 14.85% of the amount incinerated.

The plant is operated by 7 men and a superintendent. Four of these work on the charging floor, one of them dumping grates at scheduled intervals, but the use of the crane, when it is obtained, will reduce this number. The cost of operation during several months averaged 91.6 cts. per ton of refuse, was only 71 cts. some weeks; this including all operation costs, labor for clean-up on Sundays, care of grounds, superintendence, etc., and with no credit for the steam generated. When the refuse from the Air Force post brings the total amount more nearly to the capacity of the incinerator, the cost per ton will be reduced.

Flow Trough for Testing Air in Mortar

Based on considerable cooperative work, Committee C-1 of the American Society for Testing Materials on Cement, through its Sponsoring Committee on Portland Cement, has developed the Tentative Method of Test for Determining Air Content of Portland Cement Mortar (C 185-44 T). This method makes use of a Burmister Mortar Flow Trough and it is thought that a number of technologists concerned with this test would be interested in having a more detailed drawing of the equipment than is shown in the standard, although the latter does give necessary dimensions and information. The accompanying views and detail are furnished in a drawing from the Central Concrete Laboratory, Corps of Engineers, U. S. Army. Charles E. Wuerpel is Engineer in Charge.

Melting Snow on Airport Runways

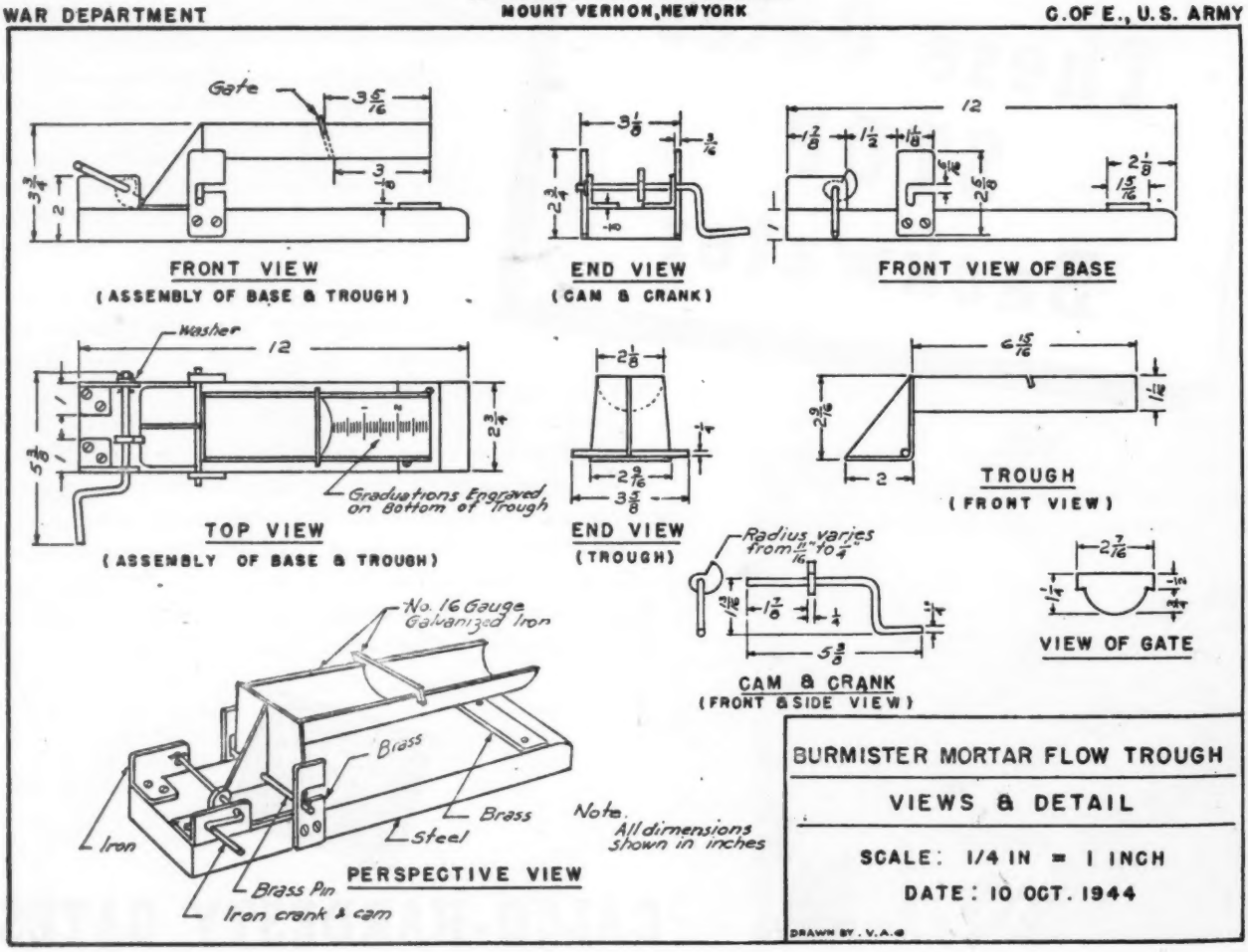
For removing snow on runways, underground snow melting lines, carrying hot water to melt snow and evaporate water, are suggested. It is believed that 1 inch to 1¼ inch wrought iron pipelines, spaced a yard apart and formed into grids of 1,000 foot circuits, will keep runways clean. The steam, fed from the boiler house, and converted into hot water, will keep the runway temperature at 40 to 45 degrees, and provide a cushion of warm air above the runway surface to absorb evaporating water.

The cost of investment in installing such a system would be offset by the smaller cost, annually, than the cost of conventional snow removal equipment. The same type of radiant heating is now being used in many airport buildings, particularly hangars, and could be extended to cover the runways, save time, money, and prevent snow and ice hazards.

A Home-Made Airport in a Day

The Redmond (Oregon) Civil Air Patrol transformed sagebrush flats near that town into runways that were used by a plane the same day. The right to 80 acres of land had been obtained and equipment was on hand, when the 30 members of the Patrol and some helpers started work at 9 A.M. and by late afternoon a 1900-ft. and a 1200-ft. runway were ready for use. Later the 1200-ft. runway was extended to 2400 ft. The runways were sprinkled, then leveled and dragged. The Redmond Flying Club planned to construct a hangar.

WAR DEPARTMENT — CENTRAL CONCRETE LABORATORY, MOUNT VERNON, NEW YORK — C. OF E., U. S. ARMY



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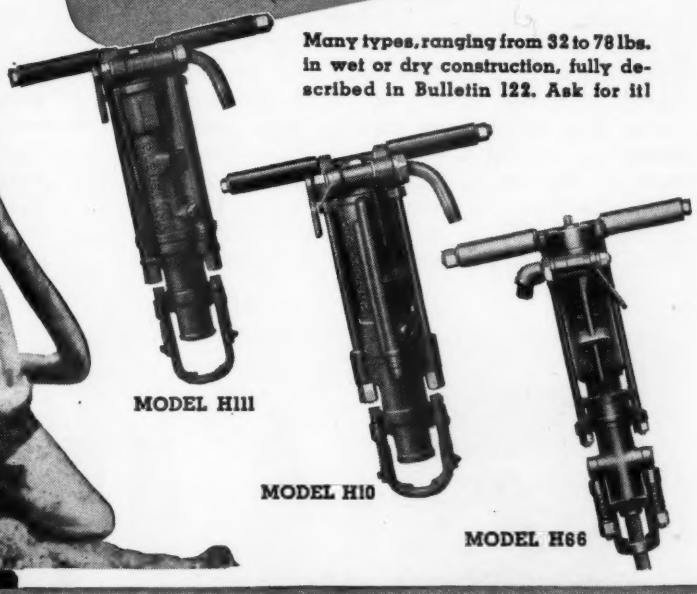
2. End-seating valve (used on most models) improves with use, prevents greater air consumption with long wear.
3. Big oil reservoir holds enough for four hour's steady operation.
4. Lubrication of rifle nut and bar prolongs their life 50%.
5. Complete lubrication of all parts of the machine insures longer wear of all moving parts.
6. Chrome plated spacer wears 3 times longer, insures full cushion on front end, avoids piston and side rod breakage.
7. Large areas of face contact hold parts in line, minimize wear at joints.
8. Floating chuck clutch prevents binding of piston.
9. Well designed exhaust port prevents freezing.
10. Throttle detents fully enclosed and well oiled.
11. Four pawl rotation—rugged and reliable.
12. Goose neck swivel air connection.

Many types, ranging from 32 to 78 lbs. in wet or dry construction, fully described in Bulletin 122. Ask for it!



MODEL H111

MODEL H10

MODEL H66

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THE CLEVELAND PNEUMATIC TOOL COMPANY

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When you need special information—consult the classified READER'S SERVICE DEPT., *pages 75-77*

Developing Additional Ground Water At Fort Dodge

(Continued from page 27)

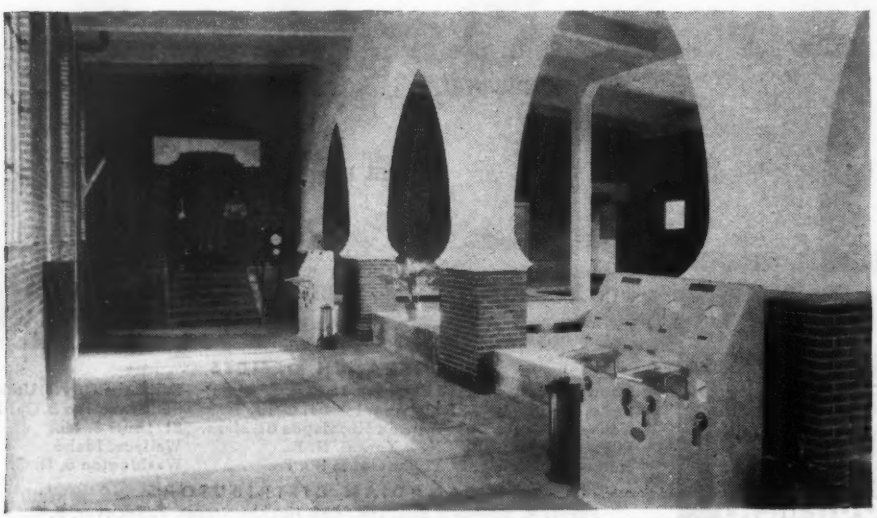
manent installation. Two 600-fpm air compressors were available in the plant and were used for air lift. The natural flow of well No. 14 was found to be 1150 gpm. (It was 3000 gpm when completed in 1935.) When the air lift was used the flow was increased to 2900 gpm on a draw down of 34 feet. A 12″ discharge line was installed from the well to the plant and it is planned to use this installation when needed.

Wells No. 12 and 14 were pumped, both separately and together, for many hours and the effect noted on wells Nos. 9, 8 and 3. Near the end of the test pumping, on December 13th, well No. 14 was being pumped at the rate of 2850 gpm., well No. 12 was being pumped at the rate of 1665 gpm and wells Nos. 3, 8 and 9 were flowing through the booster at the combined rate of 685 gpm; the total discharge therefore being about 5200 gpm or at the rate of 7,500,000 gallons per day.

With all of the wells shut down and allowing well No. 3 to flow to waste at the rate of 100 gallon per minute, no measurable effect was noted in the other wells. With the wells shut down and taking 400 gpm from well No. 8, well No. 9 lowered 0.1 foot but there was no measurable effect on the remaining wells in the field.

During the period in which the air lift was in operation in well No. 12, the well was pumped intermittently at the rate of 2250 gpm. When the air lift was shut down, the well would flow to waste at the rate of about 245 gpm. The difference in these discharge rates appeared to produce a fluctuation of 0.5 foot in the other wells in the field. When well No. 14 was pumped at the rate of 2800 gpm the water level appeared to lower 1.0 foot in well No. 12, but no effect was noted on the remaining wells.

The department has not come to a decision yet in regard to future plans. No doubt the present operating plan will be continued for some time; that is, taking the natural flow of all wells at ground level until the demand exceeds the flow, then operate the turbine in No. 12 or the airlift in No. 14, or both. It probably will be necessary to prospect for additional water in a different field in the near future.



Filter room for iron removal.

Water Supplies for Scattered Populations

(Continued from page 17)

although water mains and hydrants had been installed there, depended almost entirely for fire protection on two 35-gal. chemical tanks carried by the fire department.

It might, therefore, be less expensive for a city to insure such isolated buildings at the rates charged by fire insurance companies for well-protected property and furnish only domestic consumption through small pipes, than to furnish fire protection by laying long 8″ mains; to say nothing of the better quality of water furnished by small pipe.

But halfway measures are not desirable. When a long 2″ pipe is no longer adequate because of building development, there is a temptation to replace it with 4″ and connect fire hydrants to this.

Such hydrants would not throw effective streams without using a pumper, and in most cases would not provide to a pumper sufficient water for more than one stream. If water for fire protection is aimed at, a fire hydrant should be located within 500 ft. of the most distant property to be so protected and an 8″ main laid to it.

During the past ten years Houston, Texas, has laid 2″ cast iron mains back of each curb on new developments and for extensions, from which house services are taken off. Where water for fire protection is desired, a large main is laid back of the curb on one side. As of July 1, 1944, the city had 320.21 miles of 2″ mains, while the combined mileage of 6″, 8″, 10″ and 12″ mains was 312.54.

It would of course be better, from the viewpoint of municipal finances, to prevent this problem from arising at all. In this connection we quote the following from a paper by Carl H. Chatters before the Public Works Congress:

"Some of us have lived in cities where there are enough improvements to take care of at least twice as many people as now live in the community. In order to control future capital investment as well as operating costs, the municipalities ought to control the development and use of land through several devices. The municipality surely ought to encourage people to build inside the city instead of building outside the city. If you have 5,000, 10,000, or 20,000 vacant lots in your city and all of those lots have sewer and water available, it is distinctly to the financial advantage of the city to see that houses are built inside the city on those lots. If houses are built outside, the city not only loses the increase in valuation but also the huge investment which has already been made in those improvements, and stands to lose far more in the future because once the trend starts it is like a snowball rolling down hill.

So we ought to encourage people not only to build inside the city but also to put the new buildings where the improvements are already made. If you are in a city which has a large

(Continued on page 42)

Based on Experience

New York, Chicago, Philadelphia—the ratios are respectively, 97%, 99% and 98%. Thus it is evident that top-flight engineers *continue* to endorse the judgment of four generations of water works men.

Confidence, based on experience, is doubly important in the case of pipe to be installed underground for distribution mains. They represent the major investment in a water supply system. So we say *—trust the pipe you know about.*

Cast Iron Pipe Research Association, Thomas F. Wolfe, Research Engineer, Peoples Gas Building, Chicago 3, Ill.

THE 10 REQUIREMENTS FOR UNDERGROUND MAINS UNDER NORMAL CONDITIONS

LONG LIFE: In evaluating bids, the useful life of cast iron pipe is figured at 100 years minimum.

CARRYING CAPACITY: The carrying capacity of standard tar-coated cast iron pipe remains practically unimpaired for centuries. For the certain areas where tuberculating water is encountered, cement-lined cast iron pipe is available. Under such conditions, no other material offers the combined long life and sustained carrying capacity of cement-lined cast iron pipe.

TIGHT JOINTS: For *ordinary* pressures, cast iron bell-and-spigot pipe—for *high* pressures, cast iron mechanical joint pipe—are known to be leak-proof.

TENSILE STRENGTH: When tested under hydrostatic pressure to destruction, the ultimate tensile strength of cast iron pipe is a minimum of 11,000 p.s.i. for pit cast pipe and a minimum of 18,000 p.s.i. for cast iron pipe made by other methods.

BEAM STRENGTH: Under beam stress tests, 10 ft. span, standard 6" cast iron pipe sustains a load of 15,000 pounds and bends approximately one inch before breaking.

TOUGHNESS: Under hydrostatic pressure and the impact of a 50 lb. hammer, standard 6" cast iron pipe does not crack until the hammer is dropped four feet.

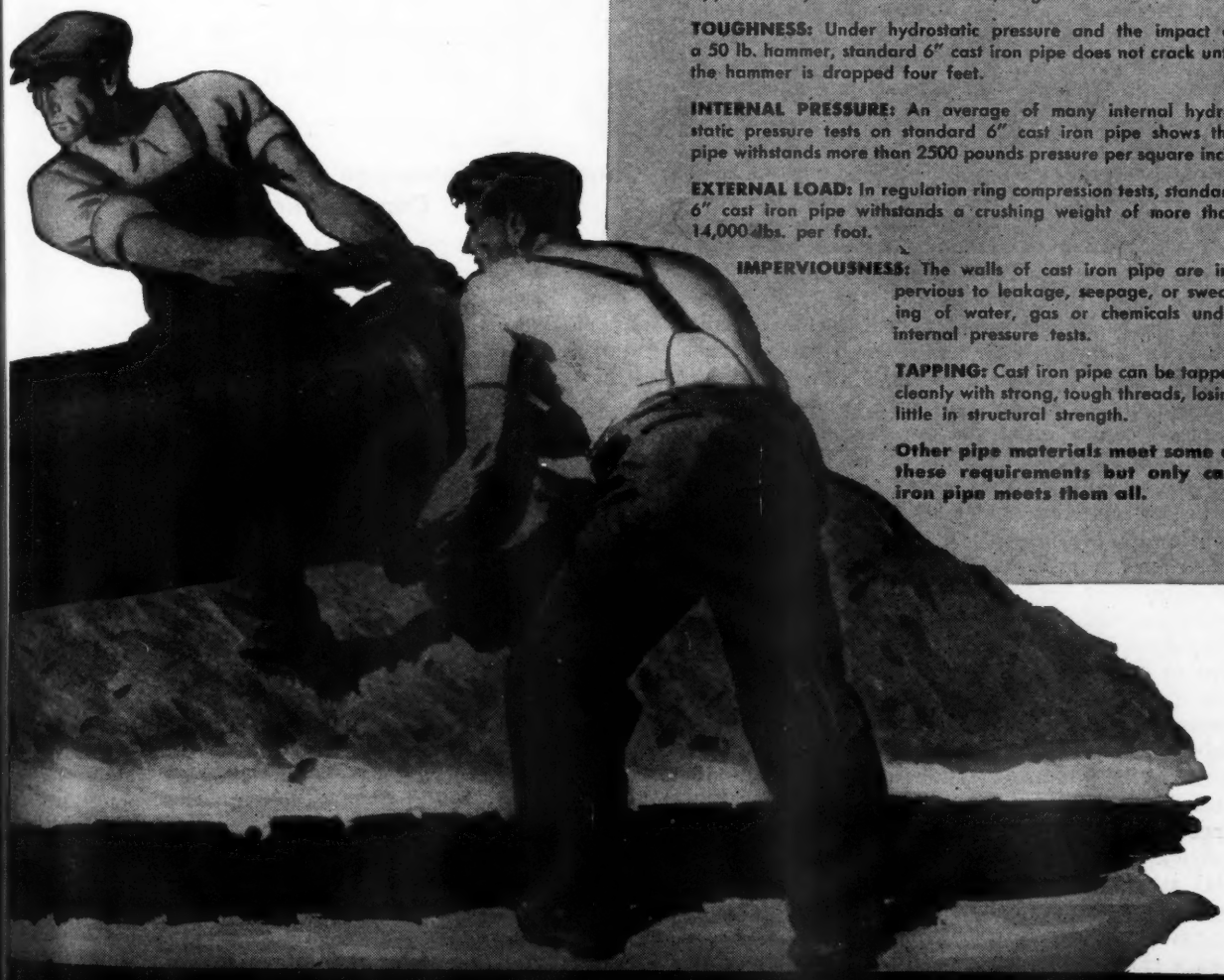
INTERNAL PRESSURE: An average of many internal hydrostatic pressure tests on standard 6" cast iron pipe shows this pipe withstands more than 2500 pounds pressure per square inch.

EXTERNAL LOAD: In regulation ring compression tests, standard 6" cast iron pipe withstands a crushing weight of more than 14,000 lbs. per foot.

IMPERVIOUSNESS: The walls of cast iron pipe are impervious to leakage, seepage, or sweating of water, gas or chemicals under internal pressure tests.

TAPPING: Cast iron pipe can be tapped cleanly with strong, tough threads, losing little in structural strength.

Other pipe materials meet some of these requirements but only cast iron pipe meets them all.



SERVES FOR CENTURIES

Tax Saver No. 1

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 75-77*

number of vacant lots, with sewer and water in front of them, you ought to try to see that the future building takes place there. If you can accomplish that, you will be able to construct a greater variety of public works than if you have to spend your money on construction which merely duplicates facilities that are already provided and not being used.

Now, one way to do this is to control the development of real estate subdivisions, both inside and outside the city. It ought to be possible for the central city in an area, through zoning and planning, to control the development, and to insist that the building which is done immediately adjacent to the city be up to the same standard as is required inside the city. If you are going to permit building just outside the city, the city ought to be in a position to insist that the building be done on streets that are properly laid out and in accordance with the same specifications and the same restrictions as are used inside the city; because sooner or later the central city in an area inherits the problems created by unwise development and unwise growth around its fringes."

Handling Dry Chemicals

Probably 80% of the waterworks plants in the United States have taken advantage of the 100-pound multi-walled paper bags in which aluminum sulfate, for instance, is available. Some years ago this material was almost universally shipped in 200-pound burlap bags. The 100-pound bag is a one-man package. It has saved time and labor in stacking, carrying and filling the hoppers of dry-feed machines. The hoppers are often shoulder high, which makes a 200-pound bag unwieldly.

Each plant must determine the size package most convenient for the operators. There are plants with chemical storage on the second floor and feeder-hoppers flush with the floor. In such cases one man can hand-truck a 200-pound bag as easily as a 100-pound bag and empty its contents at floor level into the feeder. Though the operator has fewer bags and trips to make, there still may be a two-man job of stacking the 200-pounders if ample floor space is not available.

Manpower can be conserved by speeding the movement of material from freight cars or trucks to the storage room. Whether the bags be 50, 100 or 200-pound packages of lime, soda ash, aluminum sulfate or other chemicals, the one-man operated hand-trucks can be loaded with from two to four of these packages by piling them on sideways. Very little extra effort is needed to push a fully loaded hand-truck if it is properly balanced by the pusher. A small flat board attached to the bottom support may prove helpful.

Skids are employed very successfully in a number of plants. These consist of low wooden platforms, probably standing a foot, more or less, off the floor and on which can be piled several tons of material. A low lift-truck is rolled under the skid and used not unlike the large automobile jacks used to hoist cars and shift them about. One man can easily pull several tons of material at a time to the storage room. This simple device not only facilitates unloading freight cars, but the operator can draw an entire platform of neatly piled bags close to the hopper of his feeders and save the many trips necessary if single bags were hand-trucked.

Rolled conveyor systems may not be the most attractive piece of mechanism for a water plant but they serve a most useful purpose in industry for expediting movement of bags, cartons and cases in and out of freight cars and around storage rooms. The large water plants, where sizable quantities of treating chemicals are handled, might consider the type that have movable sections that quickly can be shifted aside once the unloading is accomplished. Sections are available for turning corners. The rollers may be gravity or power driven. They are usually several inches in diameter and come in frames two feet or more in width. The conveyors may be close to the floor or at any convenient elevation.

Those fortunate in having pneumatic conveying systems are presently saving manpower. As desirable as such systems are, it is not probable that they could be installed quickly enough to be of early aid in the present manpower shortage.

Recently two plants employing chemical solution tanks have installed "Lightnin'" mixers for a job they normally did by hand. Solutions more concentrated than usual were necessary in both of these plants because of small tank capacity and it was a lengthy procedure for the operator to stir the batches manually. One of these plants has a small overhead hoist that is easily rolled along on an overhead rail from the chemical storage pile to the tanks. From 100-pound bags up to heavy drums can be lifted with the hoist at little expenditure of time or effort. At least an hour has been cut off this operator's crowded day by these two simple devices and very tiring work has been reduced to a light job.

The above comprises extracts from an article by R. W. Ockershausen, General Chemical Co., Edgewater, N. J., in *Taste and Odor Control Journal.*

Charge for Sewerage Service to Adjacent Communities

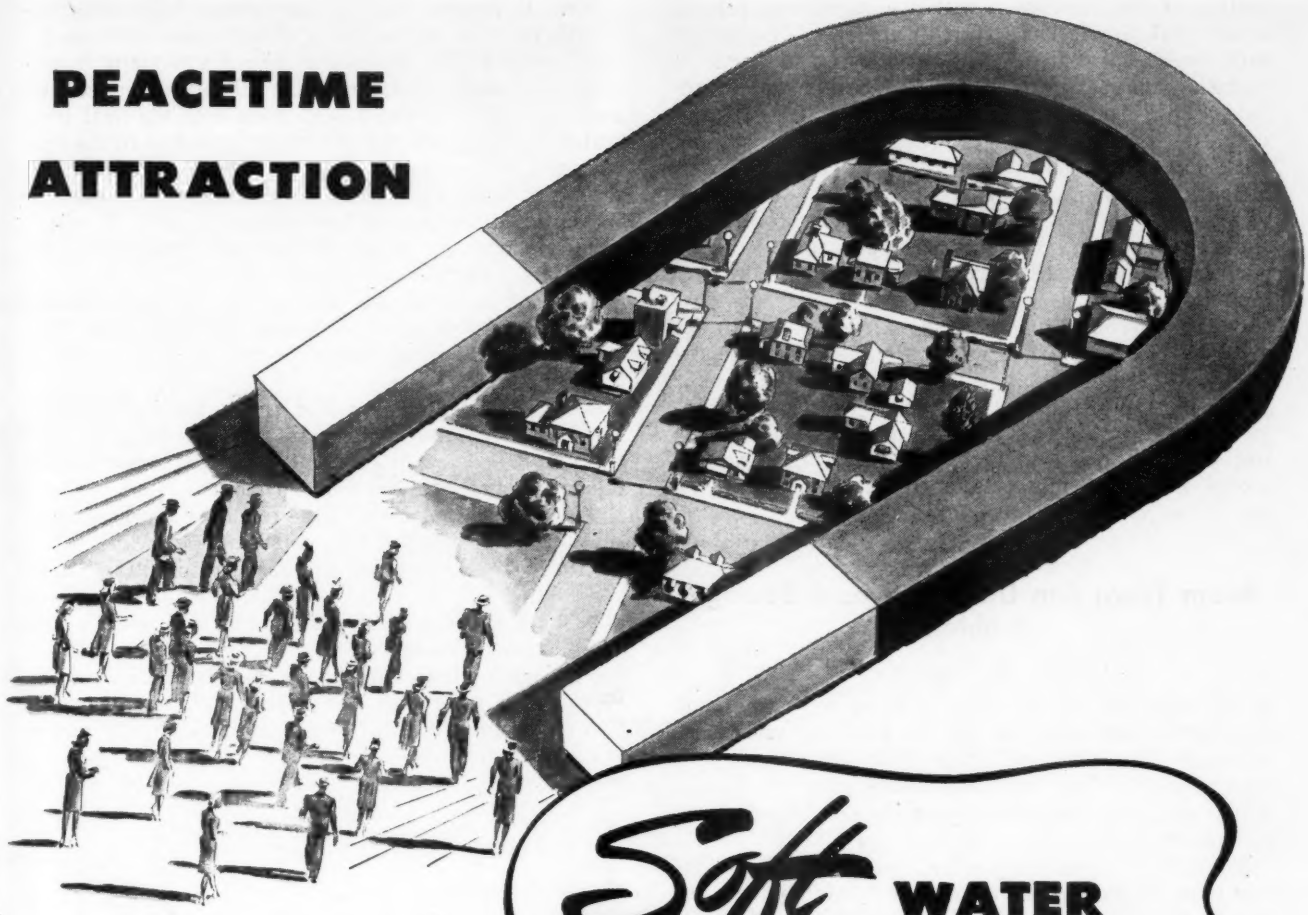
Most of the larger cities charge neighboring municipalities for sewerage service. The charge is designed to meet the cost of service and ordinarily takes into account the original investment in intercepting sewers and treatment works as well as the cost of maintenance and operation.

A variety of bases are used for outside sewerage charges. A number of cities, Akron, Baltimore, Buffalo, Los Angeles, and Philadelphia, for example, base their charges on the amount of sewage flow into their respective sewerage systems. The quantities can be determined by gauges established at the point of delivery and at the entrance to the treatment plant.

Other cities base their charges on the amount of water used. Morristown, New Jersey, charges a fixed percentage of the water bill. The cities of East Cleveland and Cleveland Heights, Ohio, pay the city of Cleveland 34 cents per 1,000 cubic feet of water. Still other cities charge on the basis of the proportion of their area to the total area served by the sewage disposal plant. Rochester, New York, uses this system for some suburbs while charging other suburbs from eight to ten cents for each foot of sanitary sewer in use. Lucus County, Ohio, contributes to the cost of Toledo's pumping station and sewer construction costs on an area basis. The county also pays charges for all new connections, and in addition contributes to operating costs on the basis of the ratio of sewage flow from the county outside of Toledo to the flow from both county and city sewers. Somewhat similar bases of charges are used in Akron's agreements with the county and a village.

A connection charge may be based upon the pro-

PEACETIME ATTRACTION



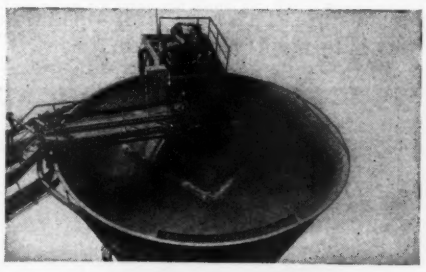
Soft WATER FOR HOME AND INDUSTRY

Brisk postwar competition will apply to cities as well as commodities. One sure way to help attract new citizens—and make present ones happier—is to provide a modern, efficient water supply.

Industrialists, especially, realize the important part water plays in plant operation, in keeping maintenance costs down. Soft water is *their* answer—the city that has it, *their* location. And all people like the water in their homes to be free of natural hardness, dirt and iron—to be good *and* soft.

Permutit* Water Conditioning equipment provides an economical solution to city management's hard water problems. Prepare *your* city for a more prosperous future—get the facts about Permutit equipment *now*.

Write to The Permutit Company, Dept. G-4 330 West 42nd St., New York 18, N. Y., or Permutit Company of Canada, Ltd., Montreal. *Trademark Reg. U. S. Pat. Off.



PERMUTIT SPAULDING PRECIPITATOR removes water hardness, dirt and color by the sludge blanket process. This new-design equipment cuts detention time, saves chemicals, takes only half the space of former methods. This is one of several Permutit methods for treating water supplies.

PERMUTIT

WATER CONDITIONING HEADQUARTERS

When you need special information—consult the classified **READER'S SERVICE DEPT.**, *pages 75-77*

portion of the population within each unit as related to the total population served by the sewerage system with costs recalculated every 10 years on the basis of changing census figures. In St. Louis this type of annual charge is made and satellite municipalities are also assessed connection charges which take into account construction and maintenance costs. The outside municipalities also agree to contribute to the reconstruction of any sewer to which they make connection and to share in the construction of any treatment and pumping plants that St. Louis may be required to provide.

Other provisions sometimes included in contracts for sewer service cover such matters as renewal; the exclusion of storm water from the sewerage system; approval of plans and standards of construction; inspection of facilities; maintenance of certain records; and prohibiting the municipality receiving sewerage service from allowing another city to connect with its sewers.—*Public Management.*

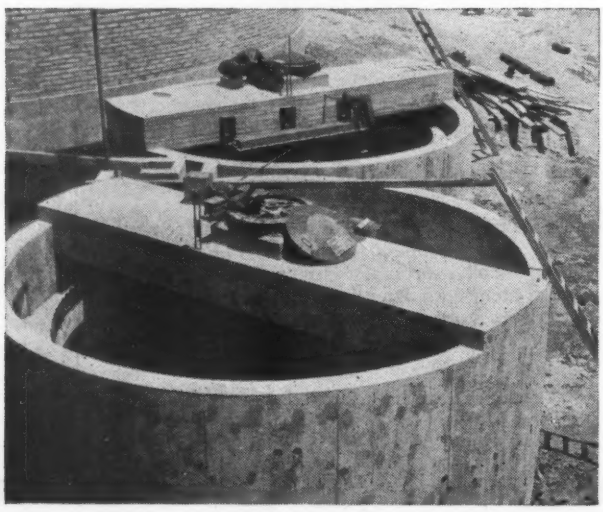
Boom Town San Diego Solves a Sewage Problem

(Continued from page 21)

by 42″ and 24″ outfall sewers. These were well over capacity for the designed flow of 1940 but now at an extremely high tide and a peak flow the sewage backs up into the Parshall flume and disrupts the recordings. A new outfall to augment the present one is now ready for construction.

The added population has increased the gas production from an anticipated amount of 300,000 cu. ft. per day to 450,000 cu. ft. per day. This additional gas is being wasted at the present time and has caused some odors. A new gas collection system is being designed with a new location for the waste gas burner. The small gas-burning furnaces used to heat the sludge have been abandoned, a better method of heating sludge having been obtained by injecting steam into it as it is pumped to the digesters. The digester tanks are kept at a more uniform temperature of about 79° F. and are operating successfully.

The sludge is run through two elutriation tanks and here again the overload sometimes causes trouble. The elutriation sludge is then piped to the vacuum filters. These filters have been very effective and remove about 70% of the moisture. This cake is dropped onto a belt which carries it to the drying system.



Elutriation tanks.

This Raymond flash drying system is proving excellent in reducing moisture to less than 10% in the final product. The overabundance of gas made it possible to eliminate the use of the oil burner in the furnace. In fact, the gas was so good that the heat generated was too great for the brick furnished in the furnace and it became necessary to change the design of the brick lining, the heat loss becoming so great that the entire furnace was hot on the outside. A year's operation with the proper brick warns you to be careful of the products to be specified.

Some of the fans and piping have become worn by the constant blowing of this sludge through them. This occurs in spite of the large amount of sand removed at the detritor.

The final product is a first grade fertilizer selling for $18.00 per ton at the plant in sacks furnished by the purchaser. At the present time one concern takes the entire output of 135 tons per month.

The chemical analysis of the fertilizer is: phosphoric acid 1.5%, nitrogen 3.4%, potassium 27%, ash 40%, moisture 10%. The fertilizer is sacked in 100 lb. paper sacks. Sufficient space is provided for the storage of the sacked fertilizer. Loaders to convey it to box cars or trucks are provided.

The sale of the sludge pays for about 25% of the operation of the plant. The following report of operation is for the month of April, 1945, a typical month in San Diego:

Sewage treated	665 M.G.
Fertilizer sacked	135 Tons
Grit removed	33 Cu. Yds.
Cost of Treatment:	
Labor	$4,122.77
Materials & supplies	2,469.68
Power	1,636.54
Overhead	1,357.25
Outlay	696.96
Depreciation	3,251.00
Sale of fertilizer	2,757.86
Revenue from other cities for sewage treatment	787.00
Total net cost of treatment per m.g.	15.69

Difficulty in getting operators to start the plant presented a problem. The Superintendent of Construction was requested to continue on as Superintendent of the Operators. His untiring efforts and the fine cooperation of the men who helped to start the plant have made it very successful in operation. There is ample room at the plant for expansion when required, but it may be that, when the rush of defense work is over and San Diego is no longer a boom town, the plant will be of ample size to serve San Diego's sewage problems for some time to come.

Consumers Read Meters

The borough of Glen Ridge, N. J., 7,900 population, is divided into three sections for meter reading purposes, one section being read during each of the three months of the quarter and bills submitted quarterly. In 1942 shortage of help and of gasoline prompted the trial of the consumer-reading idea, the consumer to read his meter and mail the result to the water department for each of the first three quarters; while during the fourth quarter the department would read all meters, checking up on the customer readings and condition of the meters.

About 90% of the customers sent in their readings, and the bills for the other 10% were estimated from previous readings. The number of estimated bills is less than the number of back calls made by the meter readers in normal times. This practice is still being continued.

HALF A HEMISPHERE
Spanned in Service

To users of Dorr equipment in all fields throughout the North American Continent, The Dorr Company offers quick, expert, engineering service... to a water works in Mexico, a sugar central in Cuba, a sewage disposal plant in Newfoundland, a paper mill in Quebec or a gold mine in Alaska.

The Dorr Company maintains a staff of thoroughly trained engineers at strategic points throughout *half a hemisphere* to render immediate service wherever and whenever needed... service in all fields to all Dorr installations whether they consist of a single piece of equipment or a complete process plant.

This extensive service is the direct result of a fundamental sales policy of The Dorr Company—Dorr takes the view that it sells not merely equipment but *the solution to the problem for which the equipment is intended.* Therefore, Dorr's interest in the purchaser does not end at the time of installation but continues far beyond. Dorr equipment provides an efficient, economical solution of the client's problem.

Avail yourself of Dorr's comprehensive knowledge of a wide variety of fields; gain the advantage of the service of Dorr engineers; take up your process equipment problem with The Dorr Company.

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ADDRESS ALL INQUIRIES TO OUR NEAREST OFFICE

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 75-77*

WHY FLINK *Ice Control* IS 6 TIMES FASTER

Spreads at 12 to 20 miles per hour, without stopping until truck is emptied. Driver speeds rapidly toward icy streets and intersections, throws Flink spreader clutch into operation as spreading area is approached. Drives on . . . spreading as he goes. As danger spot is left spreader clutch is thrown out of operation. Entirely controlled from cab without stopping.

Flink one-man self-feeding material spreader, Model WD3, equipped with Flink clutch control, is today's best answer to the danger of sudden freezes and the shortage of men and equipment. One man driving a Flink equipped truck can rapidly bring under control many miles of icy streets and dangerous intersections. No stopping until truck is emptied. As truck driver spreads along the street he controls the entire operation of the spreader.

* * *

Self-feeding. No helper to rest up or warm up. Saves men and expense. Fits all dump trucks. Attaches like original end gate. Spreads forward or backward, full or half width of streets, thick or thin, all materials up to 1".

* * *

Does not limit use of truck. Truck can be dumped as with original end gate, or spreader can be replaced by original end gate in 5 minutes. When not spreading material use dump truck for any other purpose.

* * *

Flink Spreaders are used for road, street and highway work, and for spreading agricultural limestone.

Write for complete literature.

The FLINK COMPANY

506 VERMILION ST., STREATOR, ILLINOIS

When writing, we will appreciate your mentioning **PUBLIC WORKS**

Frost Heaving of Flexible Pavements

(Continued from page 24)

pound wheel load; and 37 inches of flexible pavement and base, with one foot of subgrade subjected to severe frost action, is adequate to withstand a 20,000 pound wheel load during and immediately after the frost melting period.

Test Area	*Predominate Subgrade Soil*	*Average Pavement and Base Thickness Inches*	*Average Measured Heave of Pavement Surface Inches*	*Range of Measured Heave of Pavement Surface Inches*
I	Lean Clay	21.5	2.5	0 to 4.0
II	"	40.7	1.5	0.0 to 3.0
III	"	23.8	2.5	2.0 to 3.5
IV	Silty Till	22.0	6.5	5.5 to 8.5
V	Lean Clay	22.9	5.0	4.0 to 5.5
V1	Silty Till	20.0	5.0	3.5 to 6.0

Bridge Records of Florida's State Road Department

(Continued from page 25)

Detailed information is recorded for the main office records in Tallahassee on the Bridge Record Card, Form RR 33, which is 10½ inches wide and 6 inches long when folded horizontally. The front contains factual and construction information, with the record of maintenance on the first inside fold. The back portion is used entirely for photographs.

Form RR 33 (Field) is the same as the front of Form RR 33 but printed on letter size bond paper for field use. Information supplied through field investigations is transferred to the office form. It is made out in duplicate and the original eventually returned as a "field record."

Different colored cards are used to distinguish underpasses, overpasses and drawbridges, as well as for segregating structures of more than 20 feet in length from those of lesser overall length.

The first forty-seven items of information are recorded by the field engineer, and the next twenty by the Tallahassee office. Some few items under General Description are obtained from records and reports in the Divisional field office. Items 21 through 26 on Condition are filled in by the field engineer only for county structures. Normally these data are obtained by the Tallahassee office from Form 591, "Bridge Capacity Survey."

Complete mimeographed instructions are provided the field engineer so that he knows how measurements are to be taken and how other information is to be recorded. Special coding instructions are also available, although only manual records are maintained at present. Where the field engineer cannot reasonably be expected to obtain accurate information on such items as navigability, capacity to withstand floods, and others, the Tallahassee office assumes the responsibility for getting the information.

Each field engineer is supplied with an inexpensive camera, films and record forms RR 33-A. Pictures to be taken include (1) a general view showing the type of structure and its relation to the site, (2) close end view showing the character of the roadway and the clearance, and (3) special detail views of superstructure and substructure. Inasmuch as no sketch plans for individual bridges are made, the photographic record of essential features must be complete.

Forms RR 33 and RR 33 (Field) are so designed that the more frequently referred to data are placed in the visible margin at the bottom of each form.

Any discussion of chickens and roads today raises a profoundly serious issue.

For chickens—and all other farm products—go to the nation's dinner table over a network of farm-to-market roads *which are rapidly breaking down.* More than 50 per cent of them have no surfacing whatsoever. Rough, pitted and dangerous, they cost the farmer money, cause delays, and disrupt the nation's food distribution system.

And the problem will become even more acute as traffic increases after the war . . . unless communities begin to plan at once for road repairs and construction.

That is why we suggest you call in the Tarvia field man now. He can offer you the benefit of 40 years of successful experience in road construction, maintenance and repair. He can show you how Barrett Tarvia, with local materials and local manpower, can help solve your road problems. A friendly discussion with him can result in jobs for a lot of folks in your community at a time when jobs may be needed.

Suppose, some day, the chicken can't cross the road?

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N.Y.

New York • Chicago • Birmingham • St. Louis • Detroit • Philadelphia • Providence
Boston • Rochester • Minneapolis • Cleveland • Columbus • Toledo • Syracuse
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Barrett Tarvia*

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 75-77*

The "Year of Record" (beginning first as of 1940) is an important reference. All tabulations and summaries were compiled as of 1940. When a change is made to any bridge in subsequent years, a new card is made and put in the current visible file while the old card is filed in a "replaced" file cabinet.

The "File Number" near the lower right corner is a hyphenated number indicating the county, state road and distance from the starting point.

On the reverse side of the Bridge Record card RR 33, *routine* maintenance costs are prorated and recorded against the structure. For periodic or extraordinary maintenance, the charges are directed to each specific structure. Maintenance charges are assembled and recorded on an annual basis. These charges are reported by section lengths and as there are usually only a few structures located on each section, the pro-rated maintenance costs, reported for the appropriate structure type, are considered accurate enough for the required usages.

For state maintained structures, the field engineers of the Division of Research and Records are required to ascertain monthly any changes in existing bridges or if any new bridges have been constructed in their division. These engineers also avail themselves of information from the regular construction reports and maintenance forms 580 and 591. County structures are reported only when a county road is inventoried or reinventoried.

The field engineers are responsible for keeping a current record file of bridges, corrected semi-annually. This index lists the bridges in numerical order by counties. It is supplied to all interested personnel.

Our system of bridge inventory and records has been in operation long enough now to demonstrate its usefulness as well as its simplicity and practicability. Once established, it has been kept going with a minimum of effort.

How Winnetka Loads Tin Cans

Loading salvaged tin cans collected in Winnetka, Illinois, by ordinary methods proving inefficient and costly, Robert L. Anderson, Superintendent of Public Works of that city, took advantage of the fact that a viaduct crossed a railroad siding. He cut a 15" hole through the floor of the viaduct directly above the siding and under this suspended a chute. Then, by spotting a railroad car under the chute, the cans are loaded into it by simply dumping them onto the viaduct floor and shoveling them into the opening.

Prevention of Frost Damage in Switzerland

Investigation of damage done to Swiss highways by frost led to the suggestion of the following preventive measures: (1) The most effective is to replace the dangerous material to the full depth of probable frost penetration with material of less capillarity. (2) A layer of such material may be placed, to check the rise of capillary water. (3) Deep drainage has been suggested as a preventive measure, but the results are problematical. (4) Salts or acids may be used to lower the freezing point in the soil.

MOTORIZED-PORTABLE

TRAIL-O-ROLLER

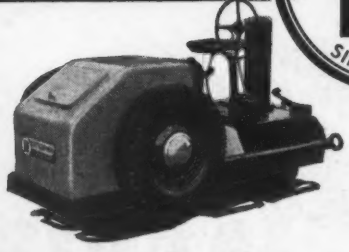
It just hooks behind a truck or tractor and goes to the rolling job. On the job the Patented Hydraulic Lift raises the pneumatic wheels and lowers the roller all in one operation. When the rolling job is done the same Hydraulic Lift raises the roller and the Trail-O-Roller is ready to go to another job.

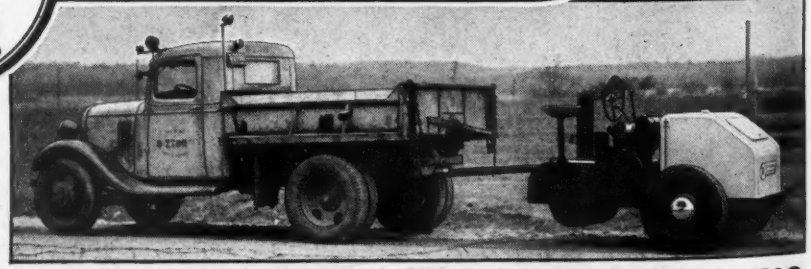
For rolling patches, constructing Roads, Streets, Airport Runways, Parking Areas, Driveways this compact Trail-O-Roller is the modern unit to do a 100% efficient job. Dozens of jobs can be rolled in one day.

GIVES AS MUCH COMPACTION AS A 5 TON TANDEM

BLACK TOP ROAD MAINTENANCE EQUIPMENT LB SINCE - 1900

LITTLEFORD





LITTLEFORD BROS., INC. . . . 452 EAST PEARL ST., CINCINNATI, OHIO

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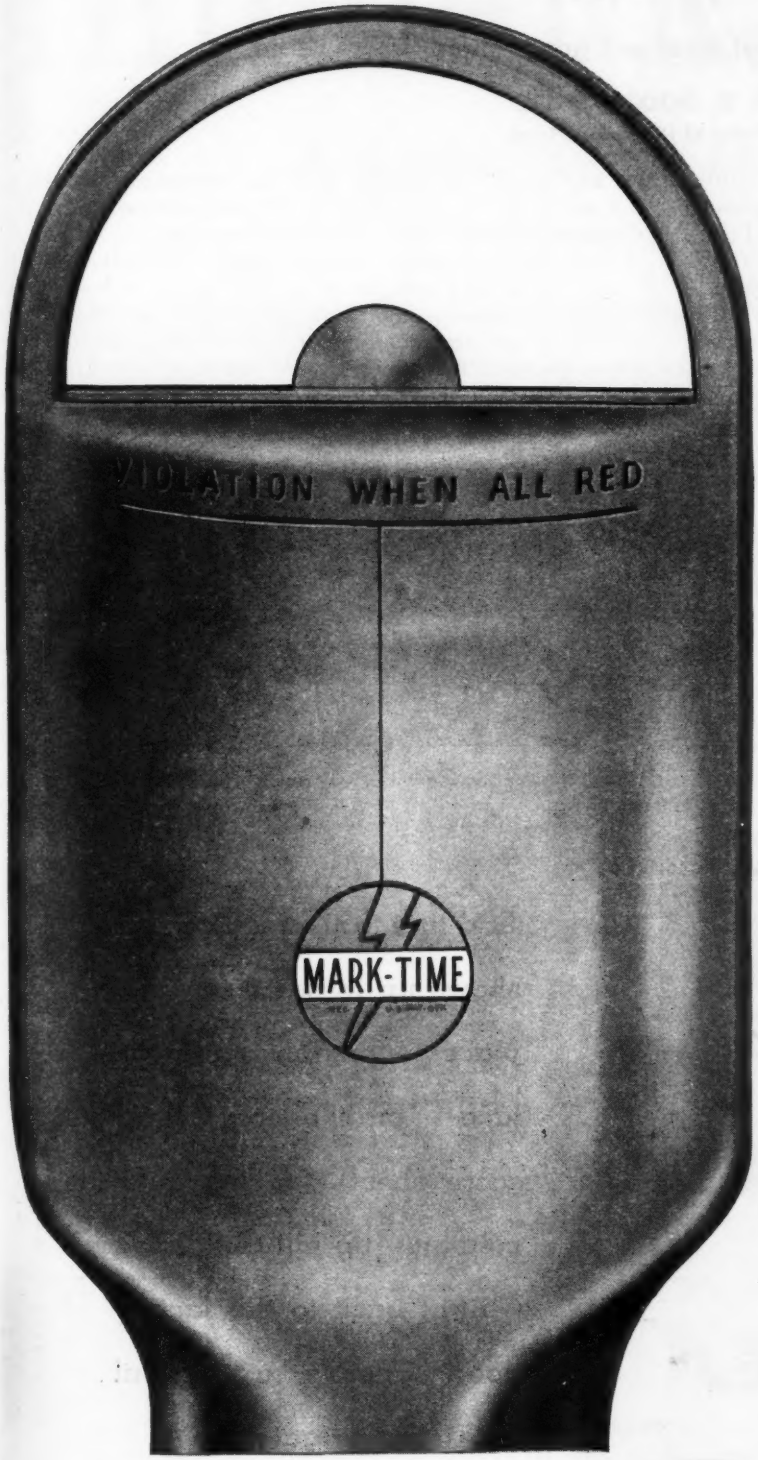
Announcing the PERFECT PARKING METER



Mark-Time's NEW *Perfection* PARKING METER

SALES TERRITORIES NOW AVAILABLE

A golden opportunity swings wide open to you with the new Mark-Time *Perfection* model. We have sales opportunities for both salesmen and distributors. Write to us about this opportunity today.

M. H. RHODES, INC., *Manufacturers*
HARTFORD 6, CONN.

MARK-TIME *Perfection* PARKING METER

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 75-77*

Dam Building and Farm Terracing with Highway Equipment

A defense of local self government

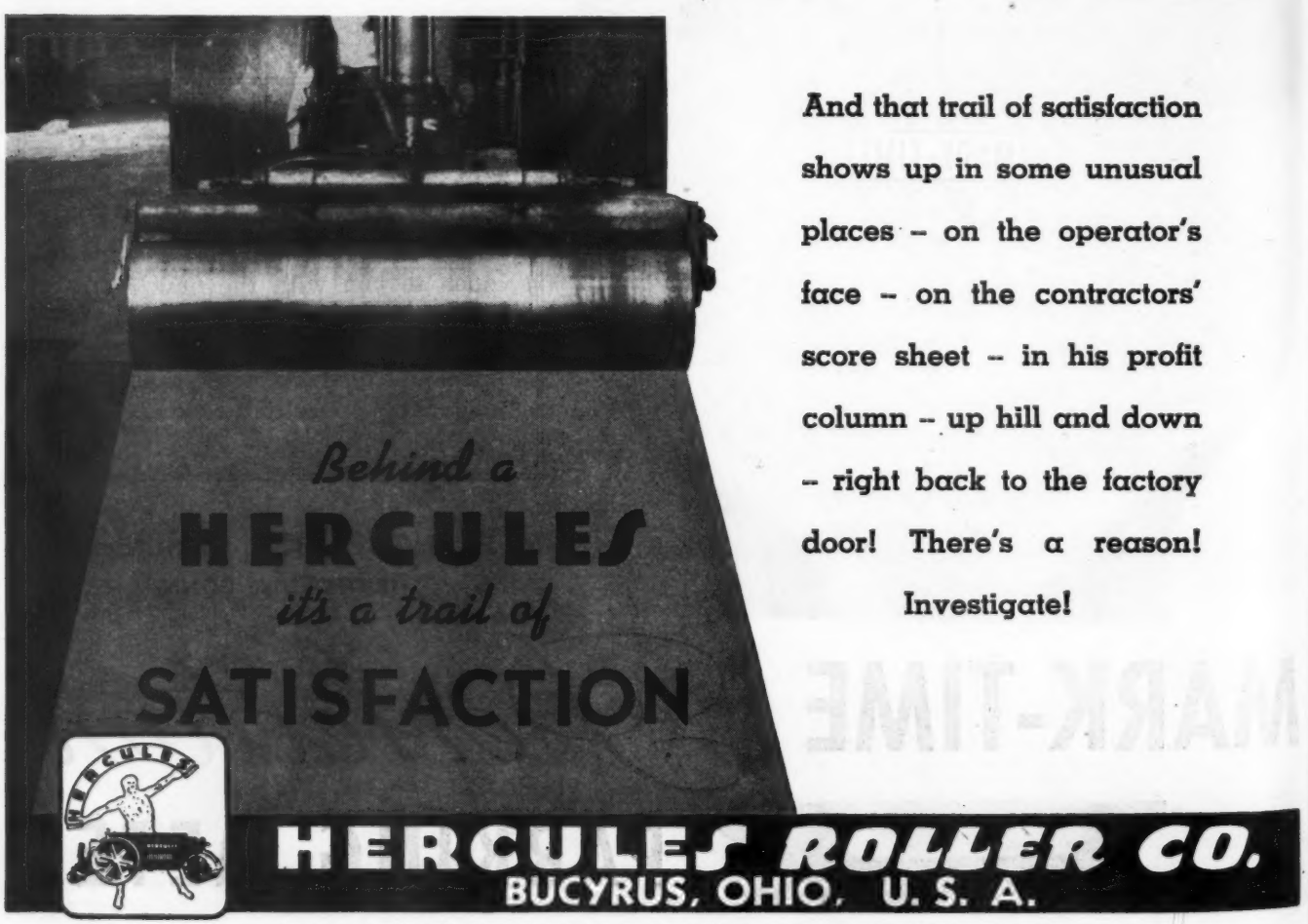
By M. O. GOODPASTURE
County Judge of Hall County, Texas

HALL COUNTY'S participation in dam building and farm terracing in 1944 was an outgrowth of need and an opportunity to satisfy that need. Local governments, local people, often are inclined to await creation of new bureaus or other governmental devices to solve new problems, although this may frequently involve loss of time, money and opportunity. But not Hall County. This county believed that soil conservation was a vital necessity. Its road machinery is idle during periods of good weather, and its men, although their wages go on. These can be used in soil conservation without increasing the county's overhead materially, and that is what this county does; using the facilities it has, already paid for, instead of dreaming about special equipment to be purchased with the taxpayers' money, while losing precious time.

M. O. Goodpasture

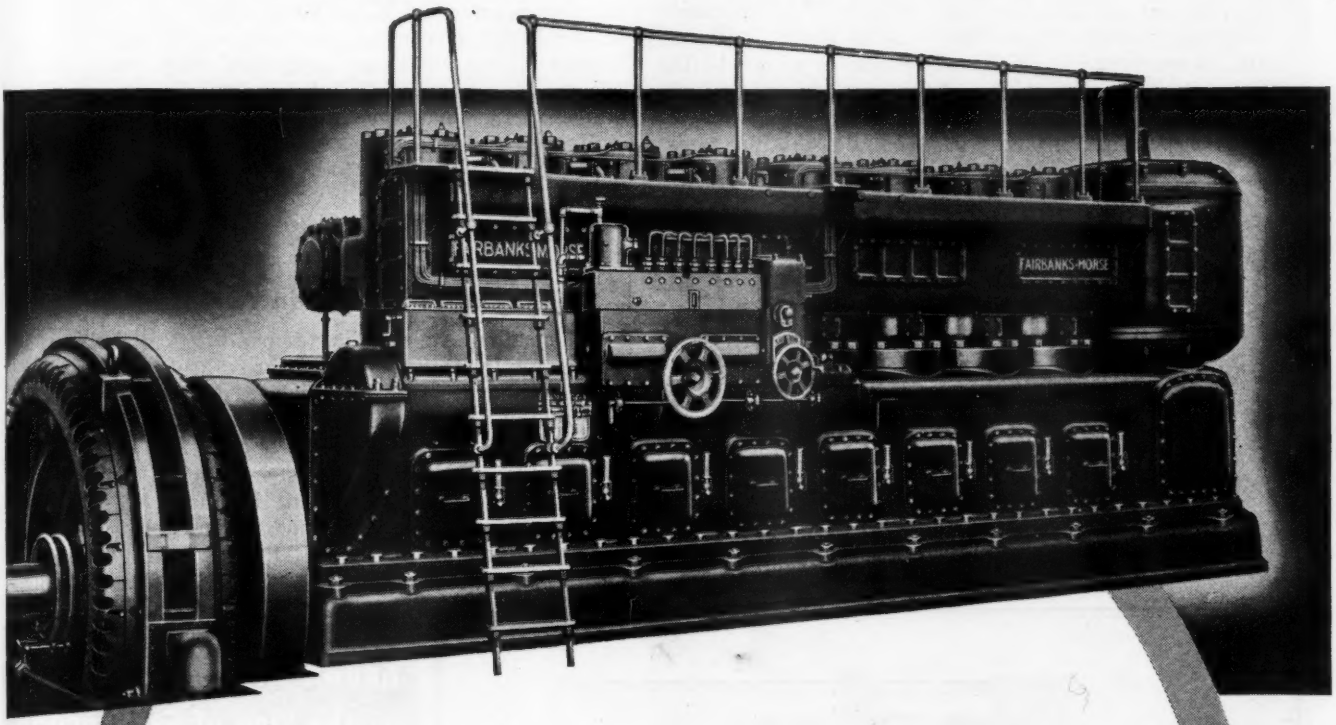
Although the county services nearly 800 miles of county roads and bridges in its 901 square miles, it has time to assist in this work, although it is a member of a well-functioning soil conservation district which operates full time. Of 350 miles of new farm terraces built in Hall County in 1944, the county built 132 miles; and did 96% of the diversion terracing,

Old Caterpillar tractor and 1 cu. yd. scraper on the Luke Lane dam.


Behind a
HERCULES
it's a trail of
SATISFACTION
And that trail of satisfaction shows up in some unusual places – on the operator's face – on the contractors' score sheet – in his profit column – up hill and down – right back to the factory door! There's a reason! Investigate!
HERCULES ROLLER CO.
BUCYRUS, OHIO, U. S. A.

FAIRBANKS-MORSE

A name worth remembering



FAIRBANKS-MORSE is the name to think of first when you need Diesel engines. The performance records of more than five million horsepower of these Diesels prove they have the stamina to stand up in sustained, heavy-duty service . . . that they are built for low maintenance cost as well as low fuel cost.

★ ★ ★

The outstanding performance records of Fairbanks-Morse Diesels have been made in every kind of industrial service . . . under every imaginable condition. These great engines have competed against almost every known source of power and come up first.

If you need power, or if you want power that costs less—applied directly or through Diesel-generator sets—ask a Fairbanks-Morse engineer to study your problem.

DIESELS

Diesel Locomotives • Diesel Engines
Pumps • Scales • Generators • Motors
Magnetos • Railroad Motor Cars and
Standpipes • Stokers • Farm Equipment

FAIRBANKS, MORSE & CO., CHICAGO 5, ILLINOIS

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which involved moving 22,035 cu. yd. of soil. It also did several jobs of patching and rebuilding old terraces. The terracing lines were run by W. B. Hooser, County Agricultural Agent, assisted by a corps of high school 4-H Club farm boys.

As a major correlated enterprise, 70 earthen dams were built for flood control, irrigation, raising fish for home supply, and for livestock and range uses, in a land where natural lakes are rare. These involved excavating 117,318 cu. yd. of earth for embankment, of which the county road department moved about 30%, private contractors doing the rest. Our latest work of this kind was the Luke Lane dam, near Turkey, which was directly supervised by County Commissioner Twilla. This dam contains about 3450 cu. yd., is nearly 25 ft. high and impounds a lake 18 ft. deep with a catchment area of 960 acres of grass land. It was built in five days with two county tractors and scrapers, at an outlay of $115. For this the Federal government paid the county $300 and Mr. Lane $210; 15 cts. a cu. yd. being the general rate on all dams in 1944.

New model Caterpillar tractor with 3 cu. yd. Adams scraper on the Luke Lane dam.

In building this dam we used two Adams scrapers, of one and 3 cu. yd. capacity, respectively, drawn by Caterpillar tractors, one of which had been bought in 1927 and used constantly since, and has required no repairs except such as could be handled easily in the county repair shop.

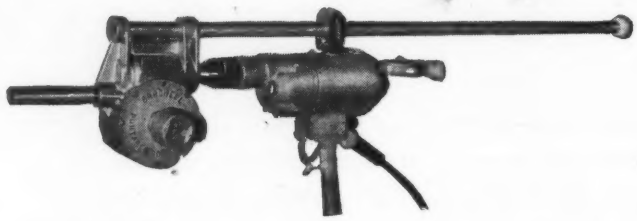
This article is not phrased in technical terms; the writer is incapable of doing that. He is only a rural county judge, writing as if to another county judge or commissioner, but hopes "you get what I mean." In recent years much has been said of the decadence of local self government; but over-towering bureaus, remotely controlled, are necessary only when local elected government abdicates. Government of any kind, or all kinds, should *supplement,* not *supplant,* enlightened honest private enterprise.

We believe here that local self government by regularly elected officials, at a minimum overhead, can function 100% effectively when it has the *will so to do.*

Laying a 48-Inch Main Across Streams

In meeting the wartime demand for an increased water supply, Houston, Texas, brought water from the San Jacinto river. This involved carrying 48" pipe across several bayous, which was accomplished as follows:

The pipe used was 48" cast-iron, with "Metropolitan" type flexible joints made by the U. S. Pipe & Foundry Co. The same method was used for crossing both bayous. On one side of the bayou two lines of narrow-gage rails were laid on ties sloping down the



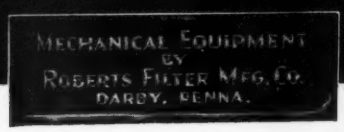
RENSSELAER - BARDWELL
PORTABLE POWER WRENCH
wherever
High Torque at Low Speed
is required

Successfully used for operating **GATE VALVES,** Sluice Gates, Pipe Cutters, Pipe Tapping Machines, Hoists, Jacks, etc. Supplied with or without Drill.

Write for Bulletin B-45

RENSSELAER VALVE CO., TROY, N. Y.

Known Around the World as the Sign of Exellence in Water Treatment Equipment



The years of experience behind the Roberts nameplate is your assurance that any water rectification problem is expertly handled to your best advantage. As manufacturing and installation engineers, the Roberts organization is equipped to meet your exact needs regardless of the size of the equipment or the complexity of the problem.

Gravity Filters
*
Softening Plants and Equipment
*
Pressure Filters
*
Zeolite Softeners
*
Swimming Pool Recirculating Apparatus
*
Special Water Treatment Equipment

We invite your inquiries
ROBERTS FILTER MFG. CO.
Darby, Pennsylvania

For activated sludge sewage treatment

Norton Company pioneered the use of ALUNDUM (fused Al_2O_3) Porous Mediums for use in activated sludge sewage plants. ALUNDUM plates and tubes are physically strong and chemically stable, and permeability and wet pressure loss are regulated by a special "controlled structure" method of manufacture. In large and small sewage disposal plants Norton Porous Mediums are giving efficient, long-lasting service.

NORTON COMPANY
WORCESTER 6, MASSACHUSETTS

NORTON POROUS PLATES *and* TUBES

When writing, we will appreciate your mentioning **PUBLIC WORKS**

NO *Skilled* LABOR

PRECALKED! no lead melting and pouring! no joints to make!

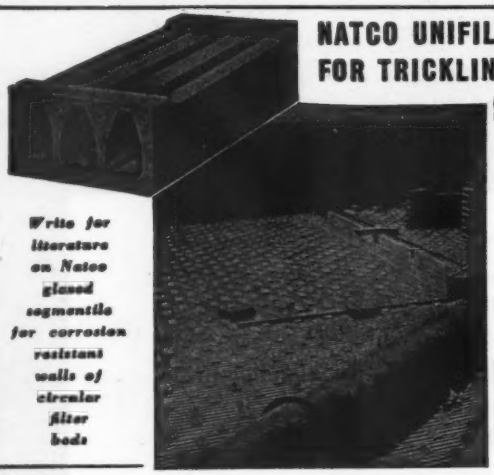
PRECALKED! no slow motion! no skilled labor! All you do is socket the spigot and calk.

PRECALKED! permanent pipe any man lay in all size mains from 2" thru 12". Prompt shipments!

McWane Cast Iron Pipe Co., Birmingham 2, Ala.

McWane PRECALKED Pipe

NATCO UNIFILTER TILE FOR TRICKLING FILTER SYSTEMS



One piece underdrain

Egg-shaped run-off

Rapid, complete ventilation

Salt glazed surfaces

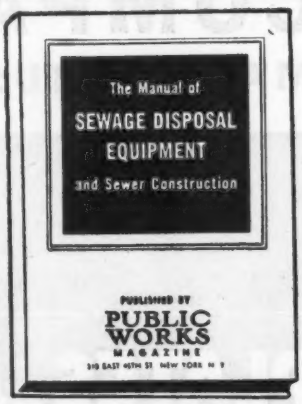
Write for literature on Natco glazed segmentile for corrosion resistant walls of circular filter beds

NATIONAL FIREPROOFING CORP.
PITTSBURGH PA.

A great help in working up plans for sewage disposal

This Manual describes every type of equipment and material available for use in sewage disposal and sewer construction. Used by leading Sanitary Engineers everywhere when preparing plans. It is the standard source of unbiased information. If you don't have a copy of the 1944 edition, write today for information on how to obtain one.

PUBLIC WORKS Magazine
310 East 45th St., New York 17, N. Y.



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Pulling cable wrapped around heavy timbers across bell on inshore end.

bank into the water. The distance between the rails was small enough to support the bell of the pipe so that its lowest point cleared the ties. At first, two lengths were placed on the rails, the spherical spigot socketed in the bell, the joint poured with lead and then calked. Other joints were similarly made up until the entire line was assembled on the track.

A sled-like guard with turned up end was placed on the ball-spigot end nearest to the water. Substantial cables were run through the pipe line and one end attached to a heavy timber laid across the face of the inshore bell. These cables extended across the bayou and up the sloping bank on the opposite side, where they were attached to a heavy tractor. The tractor then pulled the pipe line along the track, into and across the water and up to the desired position on the opposite bank. The sled-like guard slid along the bottom and banks, thereby keeping the end from digging in and placing undue strain on the cables. This method kept the line in compression so that no difficulty was encountered with loosening of the joints.

The Huntings Bayou crossing consisted of nine 12-foot lengths, with a total weight of 55 tons. It was laid in 15 feet of water. The Greens Bayou siphon consisted of sixteen 12-foot lengths, weighing 100 tons, laid in 21 feet of water.

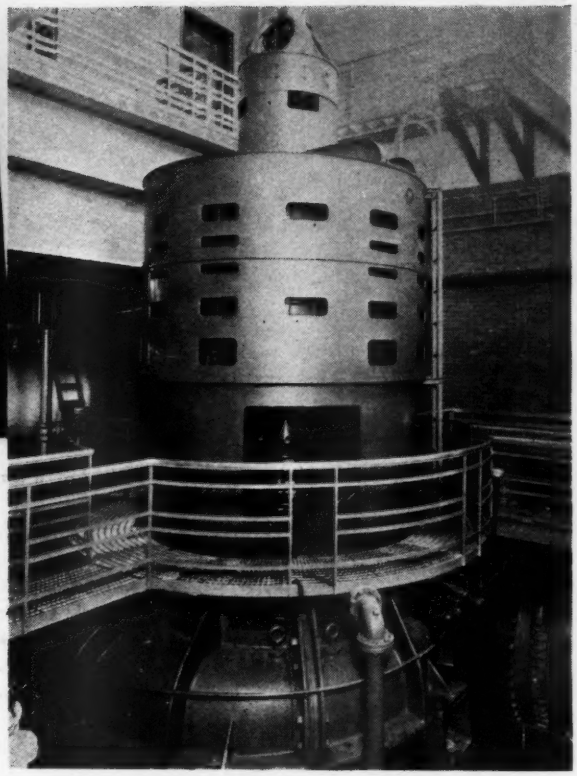
Making a Surveyor's Car from a Jeep

By W. M. BIAYS
County Engineer, Russell County, Kansas

AFTER getting stuck in mud, canyons and fields for some years with my 1941 De Soto. I made up my mind to get a car more practicable for surveying, so I made one from an Army "Jeep."

Front of surveyor's car, showing handles above windshield and range pole box below it.

OVER 80% EFFICIENCY PUMPING 870,000,000 GALLONS PER DAY



Buffalo had a big assignment—a $15,000,000 sewage-treatment plant on Bird Island. Some of the largest-capacity sewage pumps ever built would be required: six main pumps, each with a capacity of well over 100,000,000 GPM. Also, seven additional feeder station units would be required . . . 4 units at South Buffalo Station, 3 units at Hamburg Station.

The Buffalo Sewer Authority, working with Greeley & Hanson as designing and consulting engineers, and McCarthy Bros. & Fond, Contractors, selected Worthington Centrifugal Pumps.

Here are some facts about these Worthington Pumps that are now operating at an overall efficiency (pump and motor) of 81.93% at 23 ft. head. Each main pump has a capacity of 120,000,000 GPD under 23-ft. head and 145,000,000 GPD against 18-ft. head. Four pumps are driven by 550 HP, vertical synchronous motors at 180 RPM, two by double vertical synchronous motors at either 180 or 156.6 RPM. The Combination provides maximum operating flexibility of capacity range from 55,000,000 to 335,000,000 GPD without sacrificing efficiency for any combination of capacity and head.

WORTHINGTON . . . THE COMPLETE LINE

Diesel engines, gas engines, steam turbines, compressors and vacuum pumps, portable compressors and air tools, turbine well pumps, water softening and filtering systems and water meters are among the many other products carrying the Worthington trademark into sewage plants across the country. Backing these products is an engineering staff available to you —wherever you are, anywhere in the world—in selecting equipment of proper specifications.

More complete information on the Bird Island installation can be read in Bulletin RP-155. At the same time ask for Bulletin W-313-B2 which describes Worthington Axial-Flow and Mixed-Flow Centrifugal Pumps for low and moderate head services. The latter bulletin also contains useful information on selection, arrangements, engineering data and a report on Worthington installations which demonstrates a nation-wide confidence in the statement that *there's more worth in Worthington. Worthington Pump and Machinery Corporation, Harrison, N. J.*

MORE JOBS GO TO WORTHINGTON

The complete line . . . the top engineering

CENTRIFUGAL PUMPS • DIESEL & GAS & SEWAGE GAS ENGINES, DUAL FUEL ENGINES • TURBINES & TURBO-GENERATORS • GAS ENGINE-COMPRESSORS STATIONARY COMPRESSORS • WATER SOFTENING, FILTERING EQUIPMENT • VERTICAL TURBINE PUMPS WATER METERS • POWER TRANSMISSION EQUIPMENT • PORTABLE COMPRESSORS & AIR TOOLS

WORTHINGTON

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Rear view of car, showing, extending from the top, a transit tripod and level rod.

This car, with four-wheel drive and six speeds forward, is tops for rough driving conditions such as I have. It is narrow enough to drive through a listed feed field and destroy only one row of feed. On several occasions I have driven it for a quarter of a mile through a field of very high weeds and back again and thus cleared a path for a transit line. And I have driven it up and down the Saline river canyons looking for corner stones and setting up range poles, which has saved me many hours of hard walking. And I appreciate this after fifteen years of surveying 15 hours a day.

In converting the jeep, I took the regular army top bows to make the curved top corners. One of these I welded to the windshield frame. Just above the wind shield are two handles, to be used by the men who ride on the side of the car when going short distances in staking roads.

Below and in front of the wind shield is a box made of light sheet metal, used for carrying telescoping range poles (which also are my own design). The transit tripod is carried in the top of body, on one side, in a horizontal tube made of old elevator rubber belting, and the level rod in a similar tube on the opposite side. The upper body is made of light sheet metal welded to the original jeep body. All the glass is regular non-shattering wind shield glass. The side door has been cut down even with the floor, making it very easy to slide in and out of the seat. The top is wind and rain proof, and there is a gasoline heater inside.

Payment for Garbage Collection

Kansas City, Mo., has contracted for the collection and disposal of garbage at a sliding scale of rates that is believed to be unusual. The base payment is $5.65 per ton; but this is increased or decreased as the price received for the hogs to which it is fed varies below or above this, and also as the wages paid by the contractor vary. Because of high prices for hogs now, the city pays only $4.525 per ton.

Servicised Para-Plastic

HOT POURED SEALING COMPOUND

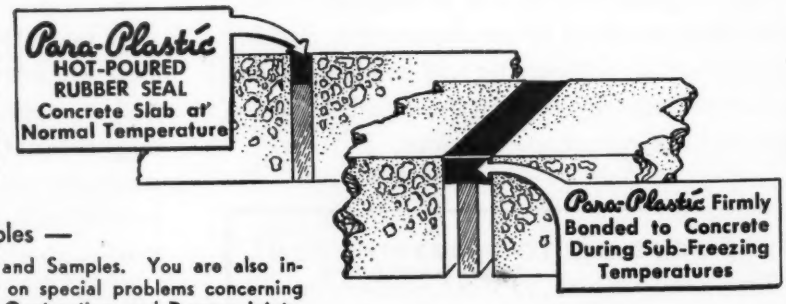
Elastic! Permanent! Waterproof!

for EXPANSION JOINTS

☆ A Resilient Compound Especially Developed by Servicised for Expansion Joints in Concrete Roadways and other types of Monolithic Construction. Para-Plastic Maintains Bond during Subzero Weather and Will Not Extrude in Summer nor Freeze or Crack in Winter.

Costly Maintenance Eliminated

A concrete Highway or Air Port Runway which has been protected by sealing the expansion and contraction joints with Para Plastic will out-live any similar pavement which has been sealed with ordinary asphalt. Para Plastic Expansion Joints are permanently sealed during all seasons of the year, whereas asphalt seal will ordinarily crack open in winter and allow spring rains easy access to the joint. Expensive maintenance of Expansion Joints is eliminated by use of Para Plastic.



— Send for Samples —

Send for Catalogue — Ask for Information and Samples. You are also invited to consult our Engineering Department on special problems concerning our method of permanently sealing Expansion, Contraction, and Dummy Joints.

SERVICISED PRODUCTS CORP.

6051 West 65th Street, Chicago, 38, Ill.

FRINK SNO-PLOWS

The Frink "V" Type Sno-Plow uses an entirely different principle than other makes. The rear of the plow is suspended from the truck attachment by two heel adjusting chains so that the weight of the snow on the moldboards is used to create a downward pressure, which ballasts the front end of the truck and counteracts side thrust. This is but one of the many features of the Frink. Write today for further information.

FRINK SNO-PLOWS
REG. U.S. PAT. OFF.

CARL H. FRINK, Mfr., CLAYTON, 1000 Isl., N. Y.
DAVENPORT-BESLER CORP., DAVENPORT, IOWA
FRINK SNO-PLOWS OF CAN. Ltd., TORONTO, ONT.

Streamlined INSIDE for Higher Efficiency and Lower Operating Costs

RUGGED SIMPLICITY OF DESIGN ELIMINATES RECIRCULATION

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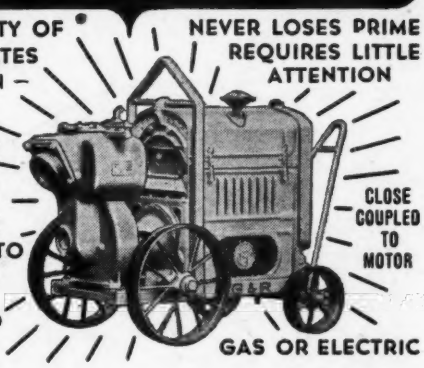

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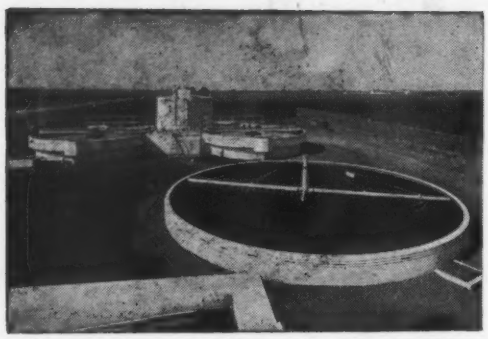


Disposal Plant at Stockton, Calif., state hospital.

The Sewerage Digest

Abstracts of the main features of all important articles dealing with sewerage and sewage treatment that appeared in the previous month's periodicals.

Rapid Sewer Repair

In Syracuse, N. Y., a broken fire hydrant connection undermined 50 ft. of pavement, which dropped into the cavity and through a length of about 15 ft. of the arch of a 46 yr. old brick egg-shaped sewer 87" high by 58" wide, with invert about 23 ft. below the street surface, almost completely plugging the sewer. Danger of a rain storm flooding a large area tributary to this combined sewer with a run-off of perhaps 50 mgd necessitated restoring it to service with the greatest speed possible. To carry the flow around the obstruction during repairs, 350 ft. of c. i. pipe was laid on the street surface by the water department and a 24" low-lift non-clog pump and a 100 h. p. motor were borrowed and installed; the pipe acting as a siphon, with the pump as a booster. The pump was brought by truck from Harrison, N. J., the motor from Rochester, N. Y., and pulley and belts from Buffalo. Meantime rented contractor's equipment and 30 German prisoners of war were opening a trench over the sewer, working 24 hrs. a day, using abundant flood lights at night. These removed the broken arch and debris 4 to 6½ ft. deep in the sewer. The arch was then replaced with 1:2:3 ready-mix concrete for a length of 65 ft., supported by a base of 1:2:4 concrete. (See illustration.) Forms for the arch were made of 2 x 4's. The arch concrete was reinforced with transverse ¾" bars on 9" centers and longitudinal ½" bars on 18" centers. This was completed about 30 days after the breaking of the water pipe, or 15 days after pumping the sewage started.[E6]

Modified Sewage Aeration

"Modified sewage aeration is a method of operation of the activated sludge process whereby sewage may be treated to any degree between plain sedimentation and conventional activated sludge. . . . The aeration period may be one to four hours and the weight of active floc returned may vary from a fraction to roughly 4 times the raw solids. . . . The aeration tank suspended solids are usually held at less than 600-800 ppm."

Studies were made by the authors at New York City's Jamaica 35-mgd plant over a 14-month period. The raw sewage was aerated without presettling for either 2 to 2.5 hr. or double this time, settled for 3 hours, and all the sludge from ½ to ¾ of the settling tanks in service was returned. The sludge not returned was thickened and digested, and the gas was used for power generation and heating and furnished, during 1944, all but 7.2% of the gas energy and 6.8% of the electrical energy.

Aeration used 0.34 cu. ft. of free air per gallon of sewage treated, and air lifts used 0.08 cu. ft.

When sludge from half the settlers in service, amounting to 6 mgd, was returned an average aerator suspended solids content of 375 ppm was maintained. When sludge from ¾ of the settlers in service, amounting to 9 mgd, was returned, it maintained an average aerator suspended solids content of 600 ppm.

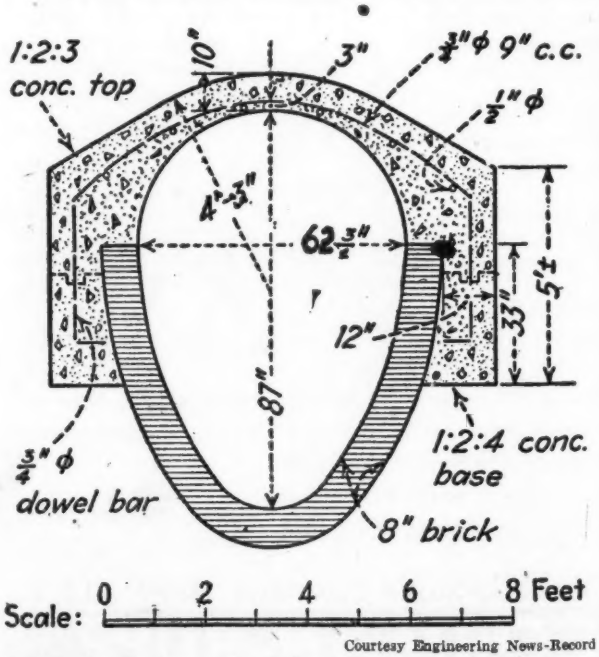
With 4 to 5 hr. aeration, more than 75% of the B.O.D. and 85% of the suspended solids were removed by the settlers, irrespective of the concentration of aerator solids. With 2 to 2.5 hr. aeration, 70% of the B.O.D. and 83% of the suspended solids were removed.

In the discussion, data were given concerning the Bowery Bay plant, designed for the "step aeration" modification of the activated sludge process, which was used for 21 months. It was then changed to modified aeration, using only 2/3 as much air, giving a 22.4% reduction in volume of air per pound of B.O.D. removed. Step aeration gave better overall removals than modified sewage aeration. "The compensation for the slightly lower plant efficiencies were lower air ratios and consequent power savings; a heavier excess sludge which improved and decreased the volume of decant liquor; higher digestion temperatures; improved digested sludge concentration and a marked economy in barging the sludge to sea."[C63]

Effect of Wastes on Treatment

Records of four years' operation of the Rahway Valley, N. J., treatment plant showed that during that time the wastes from industrial plants increased from 17.3% of the total sewage to 28.7%. The wastes included acid and alkaline chemicals, solvents and soaps, oils and grease, pickling liquors, and solids from paper, rug and similar manufacturing processes.

Extensive laboratory experiments made to check plant



Courtesy Engineering News-Record

Section showing how collapsed brick roof of egg-shaped sewer was replaced with reinforced concrete arch resting on new bases.

BOOK REVIEWS

(For other book reviews see page 78)

The Mosquitoes of New Jersey and Their Control. By Thomas J. Headlee. Rutgers University Press, New Brunswick, N. J. $4.00. 325 pp. Ill.

The war greatly intensified our interest in and knowledge of mosquito control. It is safe to say that without effective control of mosquitoes and malaria, the war could not have ended as quickly as it did. For the first time in history, the entomologist and the sanitary engineer share credit with the fighting man for military accomplishment. The application of an intimate knowledge of mosquitoes was necessary to conquer the mosquito-borne diseases of the jungles in far-away parts of the world. It is just such information that Dr. Headlee has packed into this book. Though it relates primarily to the mosquitoes of New Jersey, the information it contains is broadly applicable. In fact, Dr. Headlee's work in New Jersey mosquito control has formed the basis for many of the policies applied during the war.

Pest mosquitoes are not a recent acquisition to New Jersey. Dr. Headlee cites records back to 1627 of complaints regarding them. He recounts the history of mosquito control in New Jersey and cites the various laws relating to such control. Chapter 11 shows how good a financial investment this work has been. The tax valuation increases clearly reflect the enhancement of real estate that goes with mosquito control.

In all, 41 species of mosquitoes have been identified in the state, of which the 37 more important are described in some detail. The relative prevalence in New Jersey, general distribution, description and habits of the adult, description of the larvae and habits of the early stages are generally given, creating an excellent picture. These descriptions occupy 201 pages of the text and are accompanied by numerous excellent illustrations.

The technical chapters are brief but excellent. The chapter on structure, classification and keys is particularly worthy of note. Influence of environment contains a great deal of information not readily accessible elsewhere, covering water, food supply, natural enemies, attraction of mosquitoes to man, and mosquito flight.

The principles of mosquito control are summarized in 18 pages; larvicides in 12 pages; and mosquito repellents in 3 pages. Probably because of war-time restrictions, there is no information on the use of DDT, but the data on repellents are up-to-the-minute.

This excellent book is well-printed and is easy to read. It ought to be in the possession of every municipal or sanitary engineer and every entomologist. They will find it both interesting and valuable.

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Photo shows an "R-C" Rotary Positive Blower driven by gas engine. Capacity 800 c.f.m., 720 r.p.m., 8½ lbs. pressure.
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WRITE FOR BULLETIN 23-B-12

When you need special information—consult the classified READER'S SERVICE DEPT., *pages 75-77*

operation showed that the digestion processes were retarded because of the quantity of waste, toxic substances, combinations of various wastes, and interaction of domestic sewage with waste. The digestibility of industrial waste sludge was not comparable to domestic sewage sludge.

Plant results showed that the industrial wastes affected:

1. The sludge volume, because of (a) coagulation of finely divided material, (b) quantities of sludge present in the wastes and (c) retardation of compaction on expansion of the sludge.
2. The sedimentation detention time, by coagulation of suspended solids and precipitation of soluble materials.
3. The digestion time, because of (a) retardation of biological activities, (b) deterioration of seed sludge and (c) poor separation of liquor.
4. The supernatant liquor separation, which decreased with increasing quantities of wastes.
5. The total solids, which increased markedly with the increase in industrial flow and the coagulation effect of the wastes on the sewage solids.
6. Gas production, by toxic substances, and after their removal, by neutralized acid wastes containing small quantities of solvents.
7. Sludge drying, because of (a) the retarding effect of the wastes on digestion, (b) reduction of the drainability of the sludge, (c) decrease in density of the sludge and (d) dispersion of fine sludge particles.
8. The most important effect of the wastes was on sludge digestion with subsequent lower digester loadings and loss of gas.[C64]

Thermophilic Digestion

Single-stage plant-scale tests of thermophilic digestion conducted at Aurora, Ill., in 1931 showed that, although the sludge digested rapidly at thermophilic temperatures, the overflow liquor produced was of poor quality and the digested sludge was difficult to dewater. However, a more concentrated sludge was obtained. Experiences during the following decade suggested that these disadvantages might be overcome by the use of stage digestion, and a series of studies were conducted during 1942-1944 at Jackson, Mich., which confirmed this.

The Jackson tests showed that: With two-stage thermophilic-mesophilic digestion, 60-75% more sludge can be digested than in a two-stage mesophilic system of equal size; conventional hot-water heating coils are not satisfactory for maintaining thermophilic temperatures; direct injection of steam into the digesting sludge gave good results; direct heating of sludge by hot combustion gases, though feasible, does not appear to be economically attractive and causes serious odor nuisances. The higher loadings obtainable by thermophilic stage digestion should make the process especially attractive for existing overloaded plants, or other large plants where sufficient gas or waste heat is available for heating the raw sludge; but not generally for plants of small or medium size.[C66]

Pickling Liquor In Gary's Sewage

Gary, Indiana, has a diffused-air activated sludge plant which treats about 20 mgd. In 1944 it removed an average of 96.4% of B.O.D. and 98.4% of suspended solids. It is never troubled by bulking. Ground water infiltration varies from 50 to 100% of the water works pumpage. Spent pickling liquor is received at intervals of 2 to 5 days. At first it caused the pH to vary from above 7.0 one day to considerably below the next, but since 1942 the liquor has been neutralized at the source and not only are the biological processes now normal but the neutralized ferrous sulphate acts as a coagulant and increases the removal of suspended solids in the primary clarifiers. However, the iron waste causes clogging of the diffuser tubes with the oxide, which produces increased pressure in the blower system. When this pressure reaches 8 psi (from 2 weeks to 13 months after cleaning) the basins are taken out of service for cleaning of the tubes.

Gas production in the digesters averages about 1.5 cu. ft. per capita per day, and produces about 80% of the power

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Some Outstanding Water Treatment and Sewage Plants Using

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MIXERS • AERATORS

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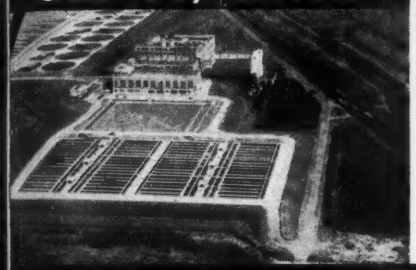
NEW YORK, N. Y.

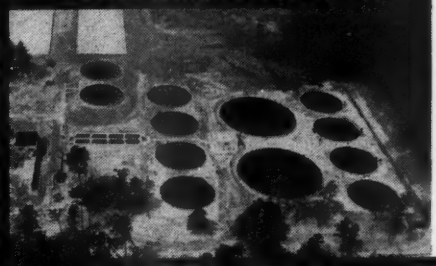
Ward's Island Sewage Treatment plant, New York City, Capacity 180,000,000 G.P.D., is equipped with Link-Belt Straightline Collectors in 32 final settling tanks.

CHICAGO, ILLINOIS



Sanitary District of Chicago, Southwest plant, cap. of 600,000,000 G.P.D.—world's largest activated sludge plant—is equipped with Link-Belt Straightline sludge collectors, bar screens, mixers, etc.

FORT BRAGG, N. C.



This Bio-Filtration plant is equipped with two Link-Belt Straightline Mixers in flocculation tanks; four primary and four final settling tanks use Link-Belt Circuline Sludge Collectors.

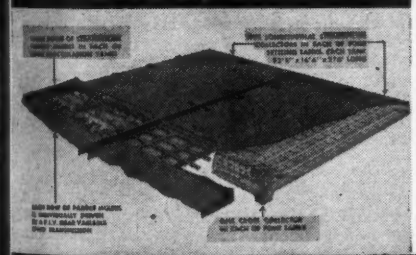
DAYTON, OHIO

Six final settling tanks equipped with Link-Belt 80′ dia., Type "A" Circuline Sludge Collectors at this modern Dayton, Ohio sewage treatment plant.

DALLAS, TEXAS

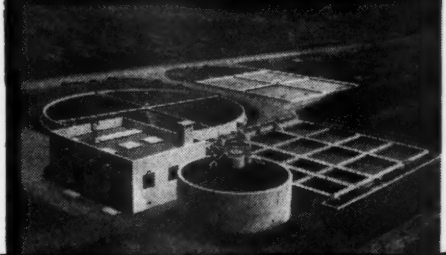
This Dallas, Texas, sewage disposal plant is equipped with two Link-Belt Straightline Grit Collectors and Washers as well as two Link-Belt Straightline Mechanical Bar Screens.

TOLEDO, OHIO



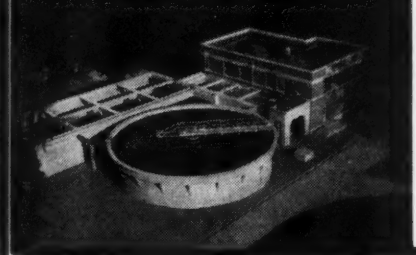
Drawing showing arrangement of 12 Link-Belt Straightline Mixers in four flocculation tanks and 24 Straightline Collectors in settling tanks of the Lake Erie Water Project, City of Toledo Filter plant.

CAMERILLO, CALIF.



Link-Belt Straightline Collectors in primary and secondary settling tanks at this Bio-Filtration Sewage plant. This system handles strong domestic and industrial sewage in single or two-stage treatment, as required.

ST. AUGUSTINE, FLA.



The Link-Belt Circuline Sludge Collector has proved highly efficient in the positive removal of lime sludge from the settling tank at this water softening plant, St. Augustine, Fla.

BALTIMORE, MD.

In this plant three Link-Belt Straightline Mechanically Cleaned Bar Screens remove the larger floating solids from incoming sewage, thus assures an even flow of sewage through the channel.

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When you need special information—consult the classified READER'S SERVICE DEPT., *pages 75-77*

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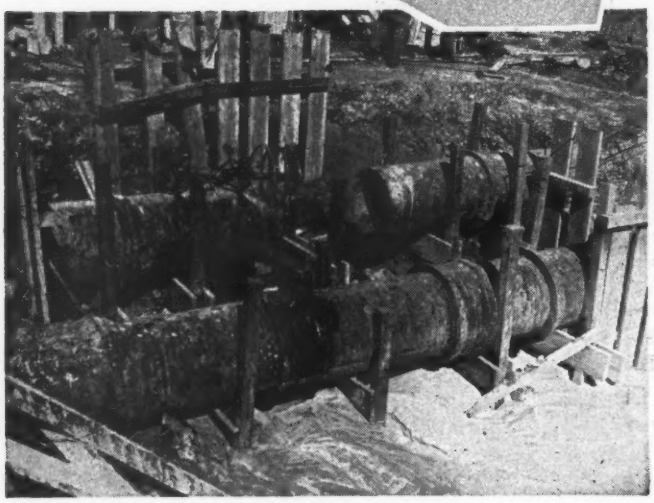

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needed at the plant. The high gas production rate possibly is due to the abundant capacity of the 5 primary heated digestion tanks and the 3 unheated secondary tanks.[H37]

Bibliography of Sewerage Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

C — *Sewage Works Journal*
July

63. Practical Applications of Principles of Modified Sewage Aeration. By L. R. Setter, W. T. Carpenter and George C. Winslow. Pp. 669-691.
64. Effect of Industrial Wastes on the Operation of a Sewage Treatment Plant. By Louis J. Fontenelli and Willem Rudolfs. Pp. 692-709.
65. Some Early Steps in Sewage Treatment. By Charles A. Emerson. Pp. 710-717.
66. Plant Scale Tests on Thermophilic Digestion. By A. J. Fischer and R. A. Greene. Pp. 718-729.
67. Exploring the Effect of Heavy Doses of Chlorine in Sewage. By A. E. Griffin and N. S. Chamberlin. Pp. 730-742.
68. The Purification Capacity of a Biofilter and Standard Filter. By H. Heukelekian. Pp. 743-769.
69. Survey of Research Projects Under Investigation and Requiring Study. Report of Research Committee. Pp. 770-781.
70. Coordinated Industrial Waste Research. By Harry W. Gehm. Pp. 782-785.
71. Sanitation and Town Planning. By James F. MacLaren. Pp. 786-794.
72. Plankton Productivity of Certain Southeastern Wisconsin Lakes as Related to Fertilization. By James B. Lackey. Pp. 795-802.
73. Design of Final Settling Tanks for Activated Sludge. By Darwin W. Townsend. Pp. 803-808.
74. Operation of Screens, Grit Chambers and Sedimentation Tanks. By R. C. Merz. Pp. 810-829.

D — *The Surveyor*
July 6

25. *p.* Sanitary Engineering in the Republic of Colombia. By Lucio Chiquito. P. 375.
July 13
26. *p.* Postwar Application of Wartime Experience in Sewage Disposal. By Humphrey D. Manning. Pp. 379-382.
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27. *p.* Industrial Wastes and Fish Life. By M. M. Ellis. Pp. 399-400.

E — *Engineering News-Record*
August 9

6. *c.* A Sewer Repair Race Against Time. Pp. 96-101.

G — *Water Works & Sewerage*
July

16. *p.* The Worthington Dual Fuel Engine. By A. M. Boehm. Pp. 223-226.
17. *p.* Mosquito Control. By R. B. Jackson. Pp. 233-234.
18. Design of Control Flumes for Grit Chambers. By W. E. Howland. Pp. 235-236.

H — *Sewage Works Engineering*
August

36. Subsidence Velocity Affects Settling Tank Efficiency. By H. M. Gifft. Pp. 380-382, 404.
37. Neutralized Ferrous Wastes Aid Activated Sludge. By W. W. Mathews. Pp. 383-385.
38. Removal of Grease by the Activated Sludge Process. By C. E. Keefer. Pp. 386-388.
39. Grease Troubles at a State Hospital. By William L. Edwards. Pp. 389-390, 406.
40. Interstate Commission Checks Operation of New York Plants. Pp. 392-393.
41. *p.* Wisconsin Industry Cooperates in Cleaning Up State Streams. By L. F. Warrick. Pp. 393, 406.

J — *American City*
August

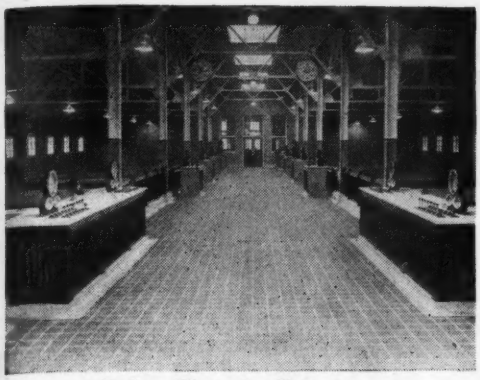
10. Modern Methods of Mosquito Control. By J. Lyell Clarke. Pp. 69-70, 95.
11. Washington's Sewage Treatment Plant. Pp. 79-81.

M — *Water and Sewage*
July

12. Canadian Sewage Plants. Statistical Data. Pp. 21-23, 40.

P — *Public Works*
August

26. Our Cities' Back Yard. By Eunice Cassidy Hendryx. Pp. 15-17, 20.
27. *p.* Balancing Strength of Sewage During Sedimentation. By S. H. Jenkins, C. H. Hewitt and F. W. Roberts. Pp. 21-22, 32.
28. *p.* Rejuvenating an Overloaded Activated Sludge Plant. P. 54.



Racine, Wisconsin, filter room.

The Waterworks Digest

Abstracts of the main features of all important articles dealing with waterworks and water purification that appeared in the previous month's periodicals.

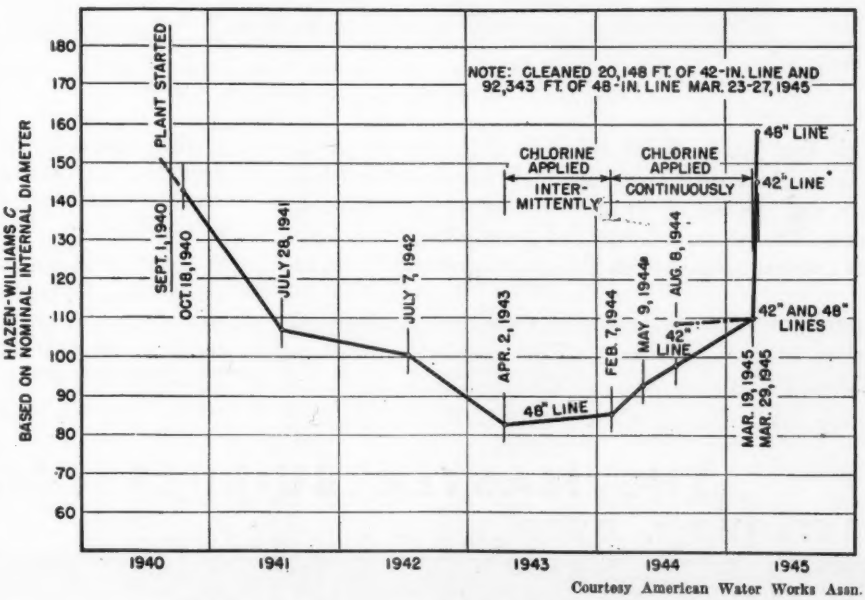
Lessons From War Experience

"During this war, many of us have had to devise means for doing repair work in different and novel ways, some of which can be used to advantage when peace comes. Now is the time to analyze the work as it is being done during the war years, in order that we may profit by retaining the useful methods which contribute to the better maintenance of water works systems.

"When war restrictions and the myriads of paper forms now necessary to inform governmental agencies of our operations and our need for materials, manpower and equipment are gone, the water works operator can again direct all of his efforts toward the better operation of his plant."[A92]

Pipe Cleaning In Wichita, Kansas

In 1940 Wichita placed in operation 25 wells and 34 mi. of cement-lined centrifugal-cast iron pipe 14" to 48" in diameter. The well water had a high iron content and a 30 mgd iron removal plant was constructed, connected with the wells by a 42" and 48" transmission main. These had initial capacity of 30 mgd, but by June 1943 this had dropped to 20.4 mgd because of masses of iron slime that had attached itself to the cement lining. There was not sufficient pump capacity for flushing these large pipe lines. Dosing with chlorine increased the Hazen-Williams coefficient from 83 to 86 in 12 months, but war demands necessitated a more rapid removal and a contract was let to the National Water Main Cleaning Co. to clean the lines mechanically, without abrading the cement lining. There were six cone valves in the line and the cleaning machine would have to pass through these, which had a 30" throat on the 48" line. A special machine was devised for this purpose, driven by pressure of the water in the pipe. A 16" blow-off was installed at the lower end of the 48" pipe to carry off the removed matter. The rate of admission of water to the pipe, and thus the rate of movement of the cleaning machine, was controlled by radio, one man walking immediately above the machine with a "handie-talkie" communicating instructions to a radio transmitting truck and this to another 2-way radio truck at the control valve. This radio control greatly shortened the time consumed. It required 4 hr. and 20 min. elapsed time to clean 20,148 ft. of 42" pipe, and 12 hr. to clean 92,343 ft. of 48". The average speed of the machine was 133 fpm in the 48" and 140 fpm in the 42". Careful and repeated tests after cleaning showed that the coefficient had been increased from 110 to 143 in the 42" and to 158 in the 48" (153 on the basis of actual diameter).[A87]



Courtesy American Water Works Assn.

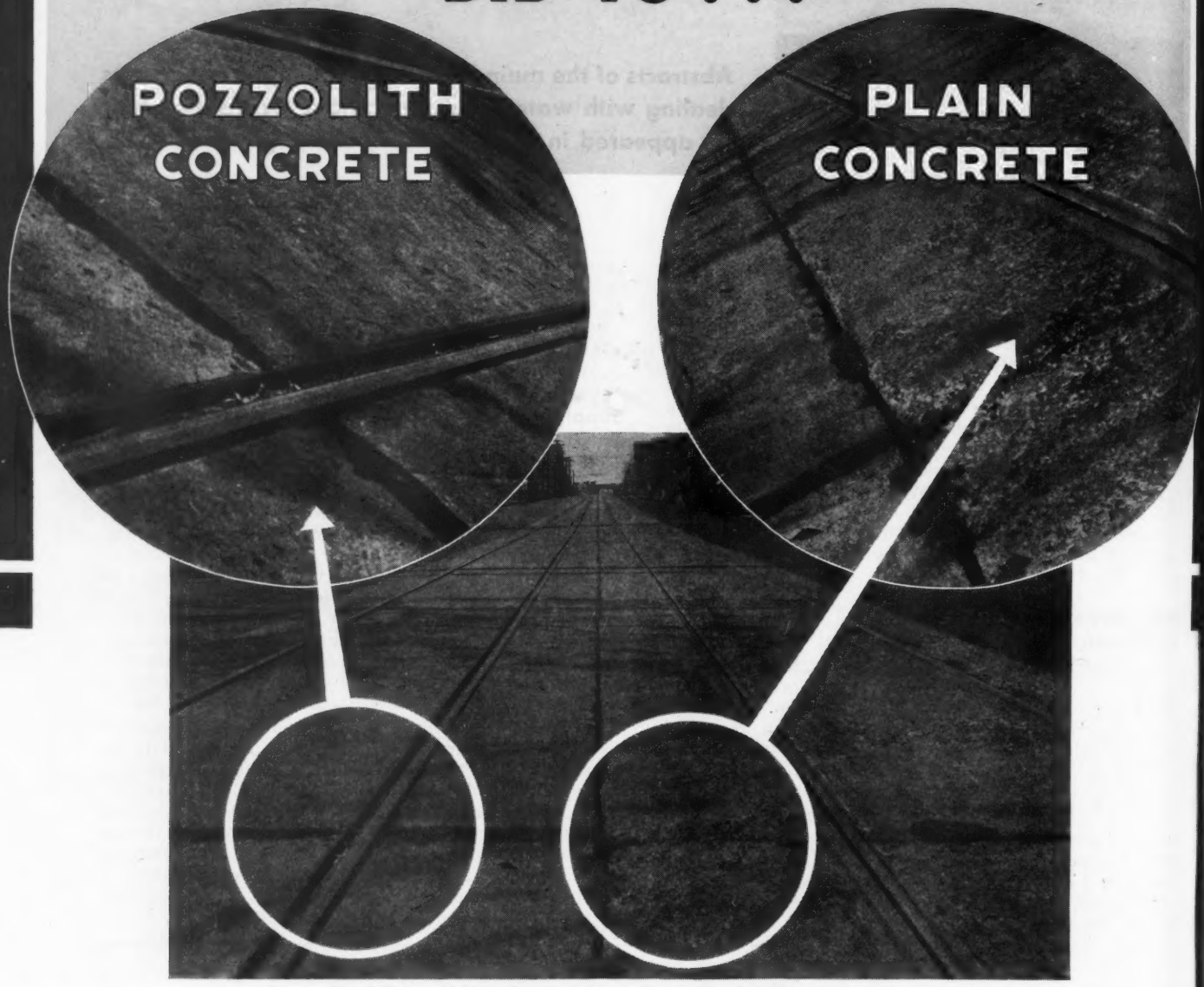
Changes in flow coefficients in Wichita's 42" and 48" pipe lines.

Supplying Water To Outside Communities

Under a law passed 30 years ago, New York City is required to permit municipal corporations and water districts in the eight counties in which its reservoirs and aqueducts are located to take water from them under reasonable regulations, paying fair and reasonable charges to be agreed upon between them. With meter rates in New York of $1.50 per 1,000 cu. ft., rates to the outside communities were 52½ cts. for Croton water and 78¾ cts. for Catskill water. The rates were based on the fixed charges and expenses of maintenance and operation of the water system outside the city limits, and are accepted as reasonable by the twenty purchasers.

Where the distribution system is owned and operated by a private water company, a permit is granted to the community, which designates the company as its agent for the distribution but is itself responsible for payment. During 1944 outside communities took an average of 26.5 mgd (in 1943 it was only 21.6 mgd) while the average consumption within the city was 939 mgd from the municipal system. An additional 65 mgd was supplied to sections of Greater New York by private water companies

HERE'S WHAT 5 YEARS DID TO . . .



Devil Strips of Pozzolith and Plain Concrete after 5 years service for Bureau of Transportation, City of New York

Through five long, hard winters this street, paved partly with Pozzolith concrete and partly with Plain concrete, underwent freezing and thawing and de-icing chemicals. The picture shows the greatly superior durability of concrete made with Pozzolith *dispersed cement.*

Field performance of Pozzolith concrete proving its great durability in all types of structures, as well as pavement work, has been recently supplemented by an exhaustive investigation made by the Nation's leading testing authority. One series of tests showed that when exposed to freezing and thawing in sea water, Pozzolith concrete proved 400-500% more durable than Plain concrete.

Providing *increased* strengths, in adddition to great durability, Pozzolith marks a new era of concrete performance . . . an era of vastly improved concrete with impressive economies in initial construction and maintenance costs.

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which obtained it from wells. All but one of the communities purchasing water from New York City have to pump it.[A95]

Ground Water In Ohio

Two-thirds of Ohio's communities use ground water for their supplies, but two-thirds of the water consumed in the state is surface water. Ground water conditions throughout the state vary widely, frequently within the distance of a hundred feet, but a definite body of salt water lies about 300 ft. below the surface of almost the entire state, with a few exceptions. Sulphur also is found at numerous points; no way has been learned for predicting where these may be.

The water table has been declining for 15 yrs. and the decline is being watched by 3711 observers, who report to the Ohio Water Supply Board. It may be necessary for communities, industries and agriculture to establish ground-water areas and regulate the amount pumped and prevent the removal of casings from salt water aquifers. It has been suggested that the state encourage the formation of conservancy districts, particularly for the purpose of ground water recharge.[L5]

System Maintenance

Watershed and reservoir maintenance consists mainly of keeping roads and trails in good condition, repairing buildings; care of dams, spillways, intake screens, gates and valves; keeping the shore lines clear, controlling algae, and watershed forestry. On pipe lines, the recording devices on the master meter, pressure gauges, etc., are usually of the 24-hour type and require daily changing of charts, winding of clock mechanisms and filling of recording pens. Supply mains in unpopulated country should be inspected frequently for minor leaks, and occasional flow tests made to learn if tuberculation is taking place, and leak surveys. Gate valves should be operated and hydrants inspected at regular intervals. Cross-connections should be looked for and inspected frequently. Maps and records should be kept up to date and complete. Motor equipment, tools and machinery should be kept in first-class operating condition by a skilled mechanic.[A93]

91% of Water Accounted For

In 1940 Manchester, N. H., accounted for 87.4% of the water pumped, that amount being actually measured by consumers' meters. In securing this result, inaccurate meters had been replaced with new ones, fire service meters were installed on services of large consumers, too large meters were replaced with small ones; the principal credit being due to junking old, inaccurate meters and great improvement in testing and repairing meters. The next year 10 mi. of poorly laid 6" to 14" mains were taken over in some annexed territory, but by applying their strict metering and leak-repair program these mains were brought up to standard and in 1944 91% of the pumpage was accounted for by the consumers' meters. The remaining 9% includes water for sewer flushing, fires, public parks, bubblers and all others not actually metered.[F43]

Serving Rural Communities

The British government aims at the ideal of a supply of soft and not aggressive water of unquestionable purity and ample quantity piped to every house in the country, especially to dairy farms for all normal dairying operations. English water engineers have plenty to say about the practicability of this ideal. The cost of serving one or two isolated cottages would often greatly exceed their market value. Even after the mains have been laid, they may refuse to take it, preferring to use without cost their

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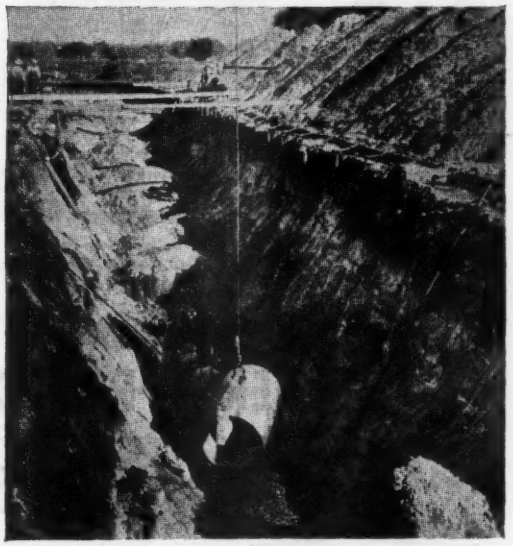
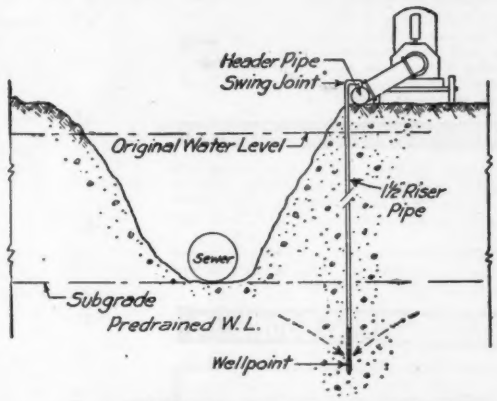
eliminated sheeting and

TRIPLED DAILY PROGRESS



The Contractor planned this sewer pipe job for tight sheeting and open pumping. *He averaged 50 feet daily.* Then 3 weeks of heavy rain raised ground water level to within 3 feet of the surface in the 15-foot cuts.



They immediately rented a three-pump GRIFFIN WELLPOINT SYSTEM, with a purchase option. After installation, they eliminated all sheeting for the entire job. Upon completion of the work, they had *averaged 150 feet per day.* They took up their option and bought the GRIFFIN WELLPOINT SYSTEM to start it again on another contract. For lower installation, operation and maintenance costs—it's GRIFFIN every time.

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own well supply, although probably polluted. The author cites three rural districts where, ten years after a public supply was made available, 34%, 31% and 25%, respectively, of the householders failed to use it.

There is not only the first cost, but the maintenance also to consider; and the fact that a water supply necessitates sewers. The expense of all this would be impossible for many small communities, and the central government should provide most of it, including the cost of maintenance.[D15]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continuously throughout the year, beginning with our January issue.

c. indicates construction article; *n,* note or short article; *p,* paper before a society (complete or abstract); *t,* technical article.

A *Journal, American Water Works Ass'n*
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87. Restoring Pipeline Capacity at Wichita, Kans. By M. E. Rogers. Pp. 713-723.
88. A Postwar Program for Jackson, Miss. By E. L. Filby. Pp. 724-728.
89. Postwar Planning in Ontario. By A. E. K. Bunnell. Pp. 729-730.
90. Postwar Utility Expenditures. By Harry E. Jordan. Pp. 731-735.
91. New York State Mutual Aid Program. By Earl Devendorf. Pp. 736-737.
92. Wartime Maintenance Problems. By Hugh S. Dewey and Harry M. Huy. Pp. 738-741.
93. System Maintenance. By Ernest L. H. Meyer. Pp. 742-746.
94. Management of Municipally Owned Water and Electric Utilities. Pp. 747-753.
95. New York City's Water Supply to Outside Communities. By Tobias Hochlerner. Pp. 754-764.
96. St. Marys, Penn., Survival and Retirement Experience With Water Works Facilities. Pp. 765-776.
97. Denver, Colo., Survival and Retirement. Pp. 777-838.

D *The Surveyor*
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15. *p.* Rural Water Supplies: Ideals and Practical Possibilities. By W. Granger. P. 403.

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16. The Breakpoint Chlorination of Water. By A. T. Palin. Pp. 417-419.

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17. The Breakpoint Chlorination of Water. By A. T. Palin. Pp. 429-432.

E *Engineering News-Record*
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19. Water Supply on Pacific Islands. By John L. Sherill. Pp. 108-112.

F *Water Works Engineering*
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42. Sweet Home, Ore., Rejuvenation. By Le Roy F. Harlow. Pp. 832-835, 859.
43. Manchester, N. H., Accounts for 91% of Its Water. By Percy A. Shaw. P. 841.

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44. Growth of Spartanburg's Water Works. By R. B. Simms and Herman F. Wiedeman. Pp. 882-884.
45. Ground Water Situation at Baltimore Badly Confused. Pp. 891, 904.
46. How Coventry, England, Handled Her Water Problem During the Blitz. Pp. 893-895, 908.

G *Water Works and Sewerage*
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28. Problems of a Municipal Waterworks Land Owner. By W. R. La Due. Pp. 209-215.
29. Filter Sand Grading. By. J. Tarrant. Pp. 218-219.

J *American City*
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12. Postwar Plan Fills Wartime Water Need. By H. E. Smith. Pp. 72-73.
13. Waukegan Gets Needed Water Storage. By H. B. Bleck. P. 91.

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24. Canadian Waterworks Plants. Statistical Data. Pp. 21-23, 57-141.
25. Services to Small Populations in Quebec. By Rene Cyr. Pp. 24-26, 144.
26. Breakpoint Chlorination Data. By A. E. Griffin and N. S. Chamberlin. Pp. 27-32.

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36. *c.* Constructing a 4,750,000-Gallon Concrete Water Tank. By M. E. Chamberlin. Pp. 24-26.
37. Census of Recent Water Treatment Plants. Pp. 28-30.
38. *c.* Lowering a 16-Inch Pipe Without Cutting Off Pressure. P. 30.
39. *p.* Sodium Chlorite Treatment of Water. By Albert W. Read. P. 34.
40. *p.* Maintaining Water Meters in Corpus Christi, Texas. By R. A. Steele. Pp. 36, 38, 40.
41. Solving a Water Shortage Involved Legal Difficulties. By Frank J. Thiery. P. 46.
42. The Two-Main System in Ireland. P. 48.

Keeping Up With New Equipment

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The Electro-Rod can be equipped with any size of cable, ranging in diameter from ¼" to ½" inclusive. It comes equipped with a cable container as illustrated, sturdy and compact, yet light-weight for transporting.

As shown in the illustration the rapidly revolving cutter blades scrape the inside of the pipe, and remove the entire obstruction or scale.

The Spartan Tool Co.'s Electro Rod can be profitably used for many other purposes, which are explained in a folder available upon request.

A New Dry Feeder for Activated Carbon

In the August, 1945, issue of "Taste and Odor Control" a description is published of a practical and apparently accurate feeder for Activated Carbon. Write Industrial Chemical Sales Division, West Virginia Pulp and Paper Co., 230 Park Ave., New York, N. Y., for a copy.

De-Ionized Water From Lab Units Developed by Illinois Water Treatment Engineers

Development of compact laboratory units for producing purified water comparable to distilled water has been announced by the Illinois Water Treatment Co. Rockford, Illinois, makers of "Illco-Way" De-ionizing Units and other water treatment equipment.

The De-ionizing process requires no heat, therefore no fuel, and it is entirely automatic in operation between regenerations. The raw water passes through two beds of special synthetic resins, the first of which removes the positive ions, such as calcium, magnesium, sodium, iron, etc., and substitutes hydrogen. The hydrogen combines with the negative sulfate, chloride and nitrate, etc., ions, to form the equivalent acids. This acidic water passes to a second tank where the acids are removed by absorption.

Illinois Water Treatment Co. engineers point out that purified water obtained by this modern, economical, ion-exchange method contains less than 1 to 5 ppm of dissolved solids (plus colloidal silica, which can be removed if desired).

In addition to its De-ionizing equipment, Illinois Water Treatment Co. manufactures boiler feed-water treatment plants, zeolite and resinous-exchange softeners, filters, and many other types of treatment equipment for water and non-aqueous chemicals and the like.

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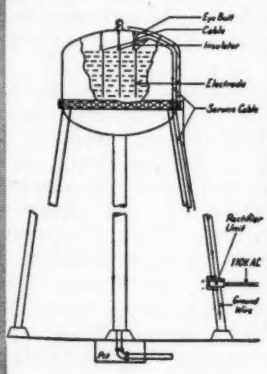

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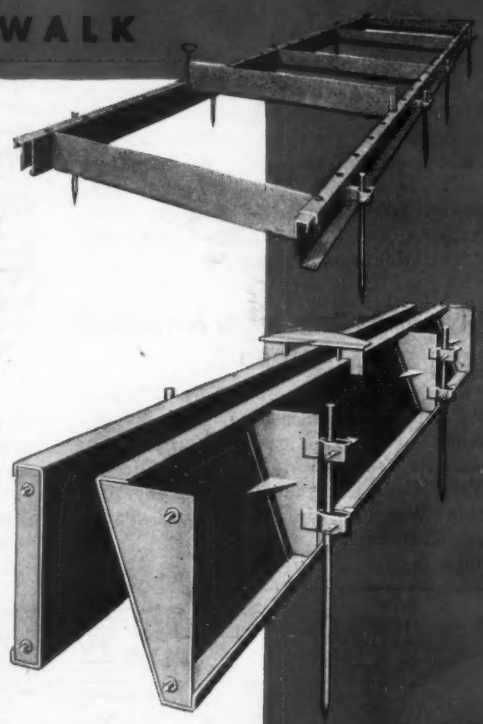

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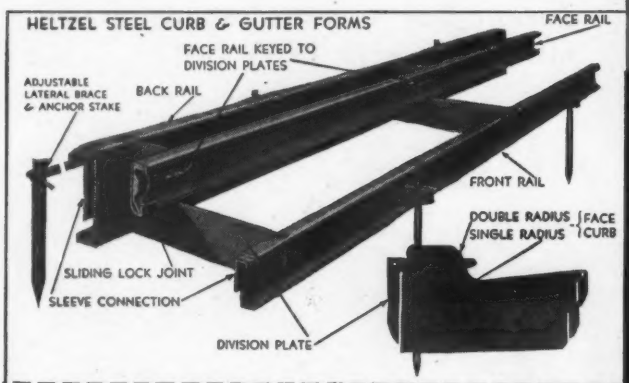

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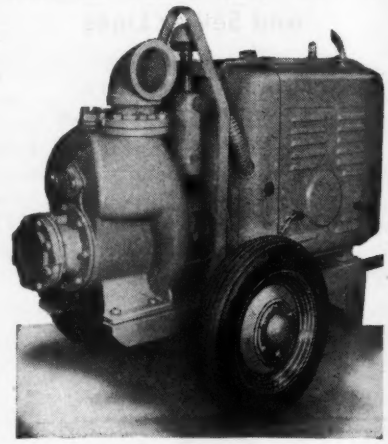
New 6-Inch Self-Priming CMC Pump Announced

Another in the advanced line of CMC Centrifugals is announced by Construction Machinery Company, Waterloo, Iowa. This 6-inch CMC Centrifugal is rated 90,000 gallons per hour with plenty of reserve capacity.



CMC 6-inch centrifugal.

Added efficiency is accomplished by new design features; such as—mixed flow impeller and properly proportioned and shaped volute. Triple self adjusting shaft seal—CMC's exclusive Dual Prime method of priming large ground shafts—built-in suction check valve—over-size ball bearings, improved flexible coupling drive and heavy duty engine are additional features, Also available with 1800 or 1200 RPM electric motors or diesel engine. Suitable for construction work, oil field service and industrial applications.

Detroit Installs New Traffic Control System

A modern, fully flexible, progressive traffic control system is being installed under the direction of the Traffic Engineering Bureau on four miles of Grand River Avenue, Detroit—a street averaging 40,000 vehicles a day with 2000 in one direction at peak hours. The system consists of new control equipment and mast-arm mounted signals, with present curb-mounted signals rearranged for better visibility on the street.

General Electric Type-DM multidial secondary controllers, used at eighteen intersections, have two dials for changing the percentage division at each intersection in any combination with the triple reset and remote cycle change features. Triple reset provides forenoon and afternoon peak hour progression, as well as midday average progression. The remote cycle change feature allows three different system time cycle lengths. A special G-E program device permits automatic use of any combination of these features, which can be set up for different combinations each day of the week for twelve weeks in advance. Changes can be set to occur at twelve-minute inter-

vals. All controllers are interconnected to a centrally located master controller.

Complete studies of traffic movements are being made by the Traffic Engineering Bureau, both before and after the installation, to determine benefits derived from such a system. Installation will be completed within the next few months.

"Wraps Are Off" General Excavator's New Type 10 on Rubber

First announced over a year ago, the Type 10 Model 105, latest development in pneumatic-tired combination crane-shovel-dragline equipment by The General Excavator Company of Marion, Ohio, now is formally unveiled after a series of exhaustive road and performance tests, according to word received from Don B. Smith, company sales manager.

Compactly-built "welterweight" offspring of the General Supercrane, pioneer machine in the pneumatic-tired self-propelled crane field, the new Model 105 is rated at ½ yard as shovel, with quickly convertible front-end attachments for a complete range of construction, excavating and materials handling jobs. Optionally equipped with either four or six 10.00 x 20 tires, or with 14.00 x 20 rib tread tires for "off the road" service, and featuring air booster steering, the new rig is capable of highway cruising speeds of more than 20 mph. It conforms to major highway regulations and in most states needs no permit to travel over the roads.

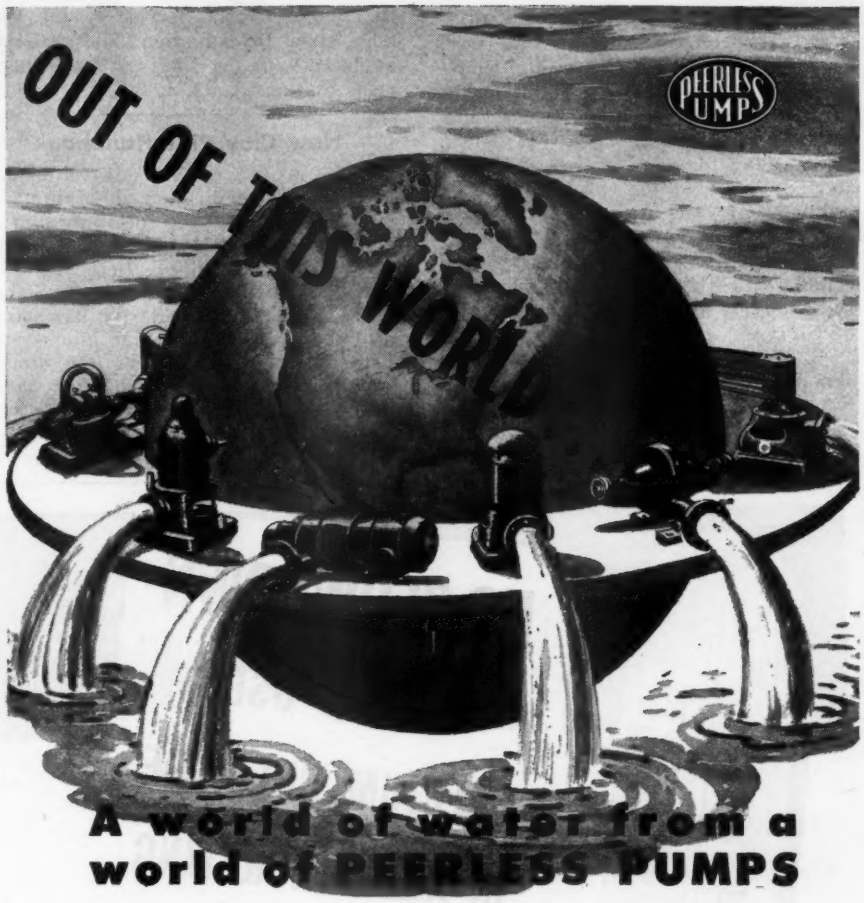
On the job, the Model 105 is said to revolutionize present standards of mobility and versatility. Fully independent travel, swing and boom at the "finger" touch of a lever—and activated by safe, positive, metered air control—make it possible to perform any of these functions independently or simultaneously at will.

Among other important advancements are optional 4-wheel drive; 4 speeds forward and reverse; easily accessible independent assemblies; self-counterweighting machinery; heavy-duty engine, transmission and clutches. Awkward, hard to shift operating jaw clutches are entirely eliminated.

General Excavator also makes a complete line of conventional crane, shovel and related equipment. Complete details on the Type 10 Model 105 are available in a fully illustrated bulletin folder from any General Excavator distributor or direct from the factory in Marion, Ohio.

H. A. Tolburg Assumes Charge of Neptune Chicago Territory

He has been with the company since 1936, covering the State of Illinois. Previous to his joining the Neptune Meter Company, Mr. Tolburg had sixteen years of engineering experience in the operation of municipal water works serving as City Engineer and Superintendent of Water.



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The tremendous Peerless water production has attained world-wide significance. Now offering the most complete line of vertical and horizontal pumps, Peerless can supply the exact type of pump best engineered for your well. If you are planning to "step up" your water supply, consult with Peerless. You will benefit by new Peerless developments—increased precision, design improvements and enlarged field service. With the recent acquisition of Dayton-Dowd Company, Peerless now offers horizontal pumps of practically every type.

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Peerless Turbine Pumps can be installed in deep or shallow wells—operating by direct connected electric motor, geared or belted head—for pumping into pressure main, elevated tank or into open reservoir.

Peerless Distributors and Direct Factory Representatives are located in every State. Ask for name of Distributor nearest you.

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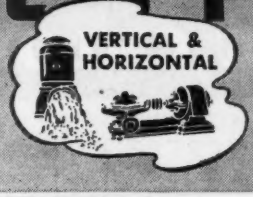

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Jones & Henry Increase Staff

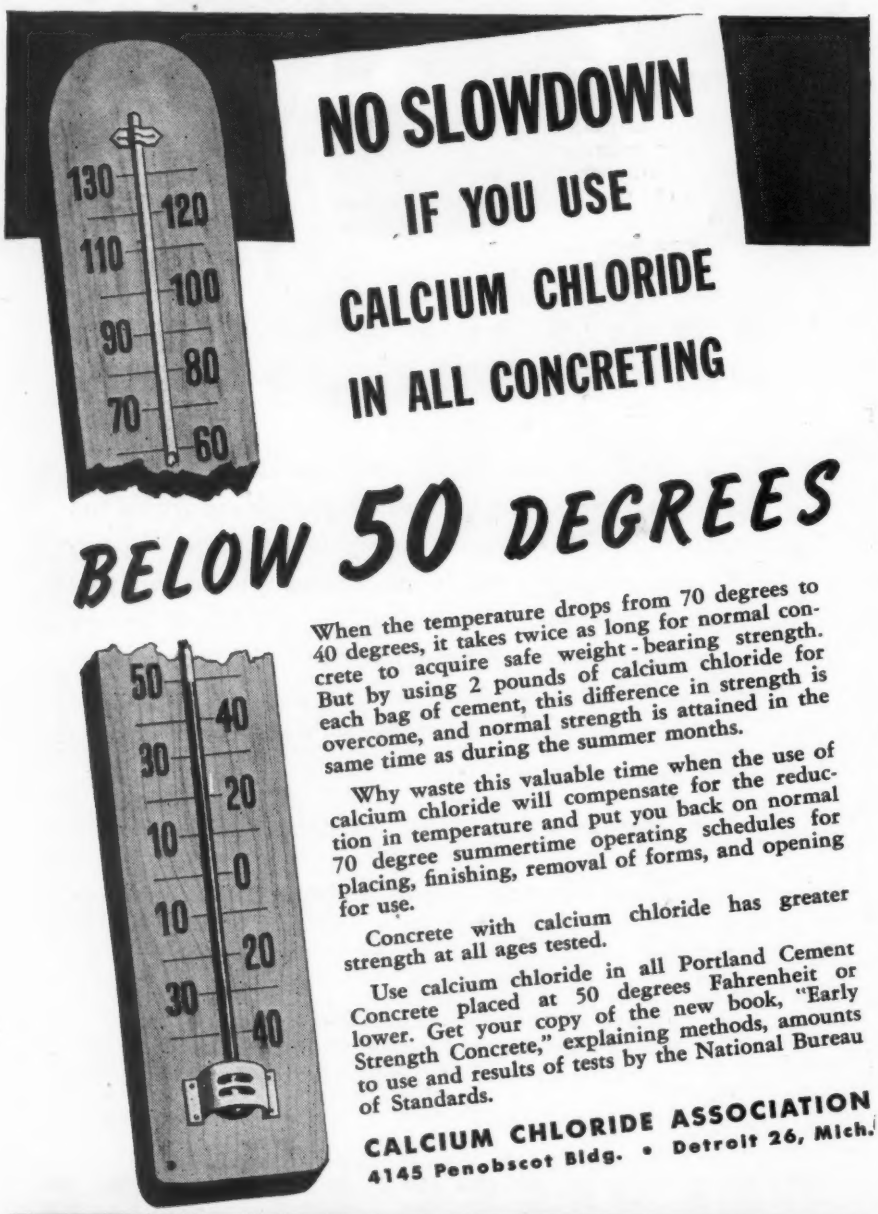
Bernal H. Swab has joined the staff of Jones and Henry, Consulting Engineers of Toledo, Ohio. He has recently completed a large flood control and drainage project near the city of Belem, Pare, Brazil for the Division of Health and Sanitation of the Office of the Coordinator of Inter-American Affairs.

Mr. Swab is a graduate of Purdue University and was previously associated with the Sanitary District of Indianapolis, and the Sanitary District of Chicago.

L. G. Williams is also now associated with the firm. Former engagements included hydraulic engineer with the City of Long Beach, California; Jr. assistant sanitary engineer with the Public Health Service on the Illinois River Investigation; and assistant engineer with the Engineering Experiment Station, Ames, Iowa.

New Clay Pipe Handbook

The Clay Sewer Pipe Association has issued a new publication containing specific dimensional and specification reference data applicable to the full line of clay pipe and fittings. In cooperation with the United States Bureau of Standards, the clay pipe industry has standardized its products in the interests of nation-wide unity of sizes and dimensions. The circulation of this new handbook is made more important because many of the dimensions have not heretofore been published, due to the recent adoption of new A.S.T.M. standards for clay pipe which carry Designations C-13-44T and C-200-44T. The new booklet is fully illustrated and is entitled, "Standard Vitrified Clay Pipe and Fittings." The circular is 8½ x 11 inches in size and contains tabulated engineering information on all items in the standard and extra strength classifications. The tables in the new booklet are arranged for convenient use by engineers, architects, draftsmen, and purchasing agencies. Copies are available, free, upon inquiry addressed to The Clay Sewer Pipe Association, A. I. U. Building, Columbus 15, Ohio.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BELOW 50 DEGREES
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110
100
90
80
70
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50
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30
20
10
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10
20
30
40
When the temperature drops from 70 degrees to 40 degrees, it takes twice as long for normal concrete to acquire safe weight-bearing strength. But by using 2 pounds of calcium chloride for each bag of cement, this difference in strength is overcome, and normal strength is attained in the same time as during the summer months.
Why waste this valuable time when the use of calcium chloride will compensate for the reduction in temperature and put you back on normal 70 degree summertime operating schedules for placing, finishing, removal of forms, and opening for use.
Concrete with calcium chloride has greater strength at all ages tested.
Use calcium chloride in all Portland Cement Concrete placed at 50 degrees Fahrenheit or lower. Get your copy of the new book, "Early Strength Concrete," explaining methods, amounts to use and results of tests by the National Bureau of Standards.
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The Wyco Concrete Vibrators Gasoline Power Units

Mounted on Wheelbarrow or on Stationary Swivel Base, these Gasoline Engine WYCO Vibrators use standard air cooled engines and have a ball-bearing jack shaft with twin V-belts, housed in metal guard. They are equipped with the WYCO Patented Jack Shaft Clutch. This simple clutch is manually operated and is mechanically trouble-free. Completely disengages the engine, thereby prolonging the life of the flexible shaft core. The engine is completely free-wheeling when clutch is released, making starting of engine quick and easy. WYCO Gasoline Engine Driven Vibrators can be supplied with speeds from 600 to 7200 V.P.M.

Write Wyzenbeek & Staff, 638 Hubbard St., Chicago 22, for catalog No. 44, describing and illustrating a number of other machines all with flexible shafts.

Counselman in New Dorr Post

T. B. Counselman has been appointed by The Dorr Company to head the firm's Contract Engineering Division, with headquarters in New York. He will be in charge of the negotiation of contracts and orders for research, development, pilot plant tests, plant and process engineering and design.

Mr. Counselman comes to his new duties from The Dorr Company's Chicago offices, where he had been manager of the Industrial Division since 1928.

R. D. Wood Co. Moves Offices

As of September 1, 1945, the Philadelphia offices of the R. D. Wood Company will be located in the Public Ledger Building. Independence Square, Philadelphia 5, Pa.

R. D. Wood Company was founded in 1803, and for over 70 years have manufactured and supplied Cast-Iron Pipe, Mathews Hydrants, and Gate Valves to the water works industry.

Osgood and General Excavator Announce Appointment of Six New Distributors

Appointment of six new distributors of Osgood and General Excavator construction, excavating and materials

handling equipment is announced by M. C. McNeil president of The Osgood Company and The General Excavator Company of Marion, Ohio.

In Southeast Florida, Allied Equipment has taken over the combined Osgood-General franchise, while Don Graze, Jacksonville, Florida, will handle sales and service in Northern Florida. The Texas Railway Equipment Company will serve the Houston (Texas) area, and the VandeWater Company, of Walden and Schenectady, New York, will serve Sullivan, Ulster and Orange counties in that state. Gibson-Stewart, Cleveland, will provide Osgood and General sales and service facilities in Ohio.

R. S. (Jack) Rheay, prominent highway and construction engineer, has been named by The Osgood Company and The General Excavator Company, affiliated power shovel and crane manufacturers of Marion, Ohio, as Division Sales Manager for southeastern United States. Mr. Rheay is widely known throughout the territory he will serve. Although plans are not completed, it is expected that Rheay will make his headquarters in Atlanta, according to M. C. McNeil, Osgood-General Excavator president.

All Osgood and General distributors are prepared to offer complete information on the many new machines and design developments being planned by both Osgood and General. Included in the list of new equipment being readied for postwar sales are the General Type 10, a one-man-operated, one-engine-controlled, all-purpose unit, mounted on pneumatic tires and the Osgood Type 100 shovel, dragline, clamshell and crane.

Peerless Pump Division Establishes Five Sales Districts

In preparation for postwar distribution of water pumps, Peerless Pump Division of Food Machinery Corporation has rearranged territorial distribution by the establishment of five sales districts.

Warner G. Vaughan has been appointed Atlantic District Sales Manager, with offices in Suburban Square, Ardmore, Pa. For several years he was the company's representative in Washington, D. C., and negotiated a number of Government contracts for Peerless Pumps and "Water Buffalos."

The South Eastern territory has been placed under the management of Charles E. Tierney with offices in the Blair Building, 215 Church Street, Decatur, Georgia.

Edward W. Pierce will continue in charge of the Central territory and as District Sales Manager is making his headquarters at the Peerless Canton, Ohio, works.

The South Western territory has for its District Sales Manager, William E. Griffin and headquarters are at 122 E. 5th St., Plainview, Texas.

B. A. Tucker is Pacific District Sales Manager, with headquarters at 301 West Avenue 26, Los Angeles, Calif. Mr. Tucker has spent a lifetime in the pump business and for several years past was Manager of the Fresno, California, Division.

New Officers for Ransome Machinery Company

Hobart C. Ramsey, Executive Vice President of Worthington Pump and Machinery Corporation has in addition, been named President of the Ransome Machinery Company, subsidiary of Worthington in Dunellen, N. J., where concrete mixers and road pavers are made. The appointment was effective August 1st.

Also named Vice President and General Manager of the Dunellen plant is J. G. Ten Eyck, who has just completed five years active service with the U. S. Navy and who was formerly President of the industrial engineering firm of Ten Eyck, Inc. Kenneth W. Horsman, formerly Superintendent of Welding and Steel Fabrication at the Worthington Harrison Works has been transferred to Ransome as Works Manager.

Newly elected directors of the Ransome Company are Mr. Ten Eyck and Carl F. Oechsle, Vice President in charge of sales.

P.F.T. Rotary Distributors at Many War Plants

Modern sewage treatment plants are the rule in today's military and armament establishments. In many of these, P.F.T. Rotary Distributors are installed to spread the effluent uniformly on the filter beds, assuring maximum utilization of the filtering area.

Write for Bulletin No. 213 containing full information, including engineering data which shows why the P.F.T. is by far the preferred rotary distributor.

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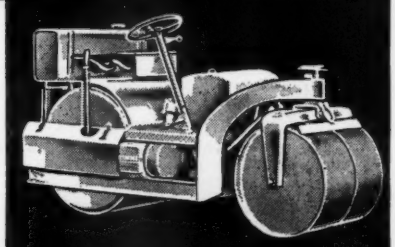

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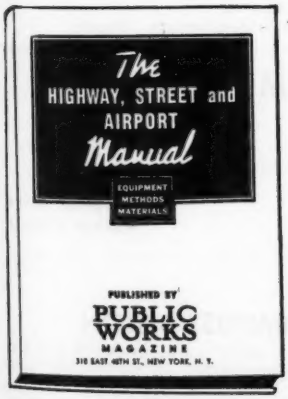

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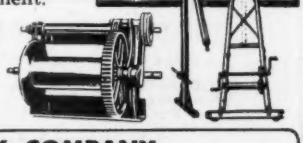

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(Continued from page 72)

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News about PEOPLE

William D. McIlvaine, Jr. Joins APWA

The American Public Works Association has added William D. McIlvaine, Jr., to its staff as Assistant Director. Mr. McIlvaine is a graduate of the University of Minnesota, also having earned his Master's Degree at that Institution. He has been employed by the University of Minnesota, the Minnesota State Highway Department, and since 1933 by the Minneapolis-St. Paul Sanitary District, his last position there being Assistant Engineer and Acting Mechanical Engineer in charge of engineering and maintenance. Mr. McIlvaine will devote his efforts to the stimulation of sound public works programs and practices, in line with the purposes of the Association.

Michael J. Sasgen

Michael J. Sasgen, 72, for many years a leading Chicago manufacturer of industrial equipment and tools, died July 27, 1945, following a stroke suffered in June of this year. He was born in Germany, and came to this country when a young man. Soon after his arrival he established his own business.

He was founder and the President of both Sasgen Derrick Company, and Grand Specialties Company, two large Chicago enterprises. A nationally known inventor and engineer, Mr. Sasgen developed many of the machines and tools now manufactured by his companies.

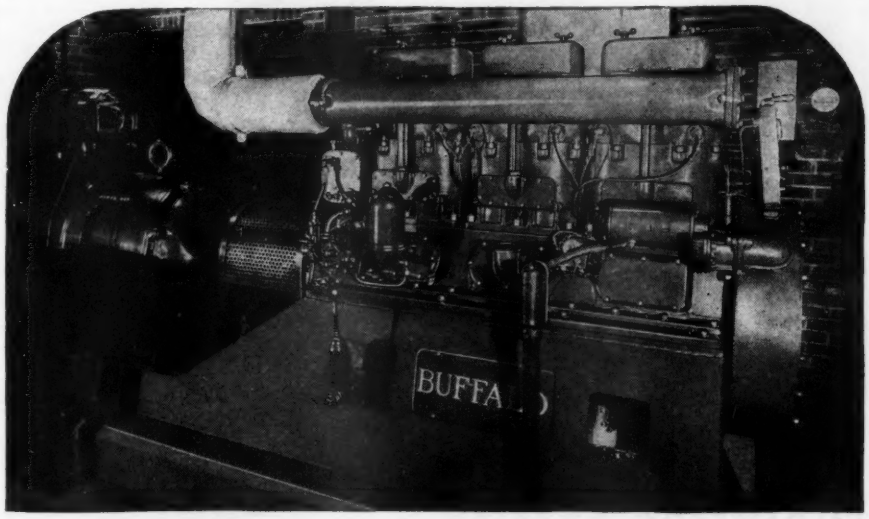
He leaves two sons both active in the conduct of their father's businesses.

New City Manager for Grand Junction, Colorado

Herbert D. Fritz, Associate Director of the American Public Works Association has accepted appointment as City Manager of Grand Junction, Colorado. Before joining the Chicago headquarters staff of APWA, Mr. Fritz served in administrative and technical capacities at Bettendorf, Centerville and Burlington, Iowa, Urbana, Ill., Canton, Mo., and Omaha, Nebraska.

CONVENTIONS

October 22-23 . . . Sixth Annual Water Conference of the Engineers Society of Western Pennsylvania will be held at the Hotel William Penn, Pittsburgh, Pa.



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If you are planning works that call for stand-by power equipment (or even if you are only interested in keeping your file up to date), you are invited to write for specification sheets and any other information you desire.

We are planning for publication a series of papers on different works that require stand-by power. Please tell us the type of installation in which you are interested.

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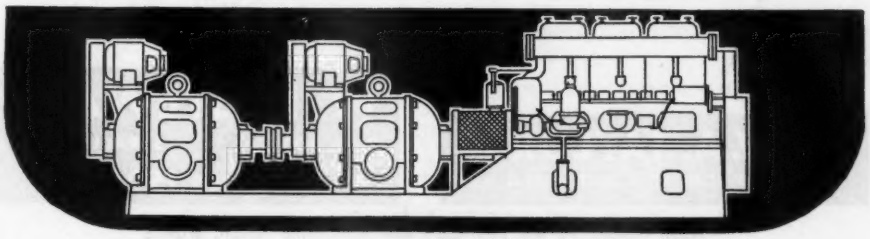

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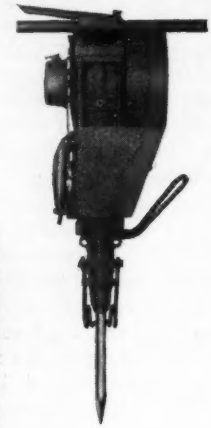

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NEW CATALOGS

Below are described the latest catalogs received by PUBLIC WORKS. All are available free on request to the manufacturers whose names are given.

New Bulletin Describes Cathodic i.e., Electrical, Method of Preventing Rusting

Bulletin No. R-181—just issued—describes Rusta Restor, the cathodic, i.e. electrical, method that prevents rusting of steel water tanks, piping, and other steel structures. The bulletin illustrates the action with simple, easy to understand experiments, describes the equipment, includes a table of comparative costs, etc. No obligation. Write the Johnston & Jennings Co., 864 Addison Road, Cleveland 14, Ohio.

Corrosion Resistant Materials and Equipment

The above is the title of a 16 page folder describing Tygon Plastic Compounds, Tanks and Lining Materials, Tygon Paint, Chemical Stoneware, Corrosion-Resistant Masonry, Mixing Equipment, etc. If you have a corrosion problem, write U. S. Stoneware Co., Akron 9, Ohio, for bulletin H.

Novel Feature Presentation of All-New All-Purpose General Type 10

General Excavator, of Marion, Ohio, has just released a uniquely arranged Specifications Bulletin Folder on the original rubber-tired "Machine of Tomorrow," the Type 10 Model 105. This ½ yard self-propelled rig (evolved from General's pioneering Supercrane) combines the functions of shovel, crane and dragline all-in-one. Announced more than a year ago, the "10" has since been undergoing a series of exhaustive road and operational tests.

Included in the 2-color folder describing the new machine is a series of detailed descriptions covering Power Flow, Construction and Operation. A fast-moving photographic technique—large pictures with brief factual text—portrays graphically the Type 10's features and advantages. They include 20 plus mph highway speed; metered air control; fully independent travel, swing and boom; optional 4-wheel drive; air booster steering; heavy-duty engine, transmission and clutches; 4 speeds forward and reverse; easily accessible assemblies; quick changeover to any front-end attachment; long life, and many others. These special folders on the new combination rig are available free from General Excavator Co., Marion, Ohio.

enerating Sets, Diesel

422. New booklet describes Sheppard iesel Generating Sets that make low cost ectricity from cheap fuel and give de-ndable service in the hands of any aver-e operator. Write R. H. Sheppard Co., 0 Middle St., Hanover, Pa.

boratory Equipment

423. pH and Chlorine Control. A dis-ssion of pH control and description of mparators, chlorimeters and similar de-ces. An 80-page booklet. W. A. Taylor & ., 7301 York Road, Baltimore 4, Md.

anhole Covers and Inlets

429. Street, sewer and water castings various styles, sizes and weights. Man-le covers, water meter covers, adjustable rb inlets, gutter crossing plates, valve d lamphole covers, ventilators, etc. escribed in catalog issued by South Bend undry Co., Lafayette Boul. and Indiana ve., South Bend 23, Ind.

eters, Gas

430. Bulletin No. 40-B-13, issued by oots-Connersville, explains reasons for gh accuracy and long life, low mainte-nce and operating costs claimed for eir Rotary Positive Displacement Gas eters. Contains size, capacity and dimen-on tables; efficiency curves. Write Roots-onnersville Blower Corp., 502 Valley Ave., onnersville, Ind.

eters, Venturi

432. New bulletin illustrates Builders r Relay system of transmission for the nturi Meter which is particularly useful r liquids containing suspended solids e sewage. Eliminates corrosion, clogged pes, etc. Write Builders-Providence, Inc., Codding St., Providence 1, R. I.

433. "The Selection of Main Line eters," a highly informative and useful esentation prepared by a competent en-neer, J. C. Thoresen, describes forms of fferential producers and quickly solves pical problems with the use of graphic arts. Write Builders-Providence, Inc., Codding St., Providence 1, R. I.

eters, Water

434. "Watchdog" water meters, made standard capacities from 20 GPM up; st-proof or split case in household sizes. l parts interchangeable with present odels of same manufacturer. For bul-tins, write Worthington-Gamon Meter ., 282-296 South St., Newark, N. J.

pe, Cast Iron

437. Cast iron pipe and fittings for ater, gas, sewer and industrial service. uper-deLavaud centrifugally-cast and t-cast pipe. Bell-and-spigot, U. S. Joint, nged or flexible joints can be furnished suit requirements. Write U. S. Pipe and oundry Co., Burlington, N. J.

438. "Cast Iron Pipe and Fittings" is well illustrated 44 page catalog giving ll specifications for their complete line Sand Spun Centrifugal Pipe, Fire ydrants, Gate Valves, Special Castings, c. Will be sent promptly by R. D. Wood ., 400 Chestnut St., Philadelphia 5, Pa.

439. McWane Precaulked Joint Cast on Pipe, in all sizes from 1¼ through inches for water and sewerage, equipped ith various type of factory-made joints, well as B. & S. joints. Illustrated book-t issued by McWane Cast Iron Pipe Co., irmingham, Ala.

pe Forms

440. Making concrete pipe on the job give employment at home is the subject a booklet by Quinn Wire & Iron Works, 21 12th St., Boone, Ia., manufacturers of Heavy Duty" Pipe Forms. Sent promptly request.

pe Pusher

444. One-man-operated Hydraulic Pipe usher pushes pipe through ground under reets, sidewalks, lawns and other ob-acles. Pays for itself in man hours saved first few jobs. For complete facts and ices, ask for booklet S-117. Greenlee Tool ., 2042 Columbia Ave., Rockford, Ill.

pe, Transite

445. Two new illustrated booklets, ransite Pressure Pipe" and "Transite wer Pipe" deal with methods of cutting ts of installation and maintenance of e lines and summarize advantages re-ting from use of Transite pipes. Sent omptly by Johns-Manville Corp., 22 East h St., New York 16, N. Y.

pe Joints, Sewer

448. Asphaltic Sewer Jointing mate-ls are described and instructions for ing them are included in a folder. Pre-ulded Sewer Pipe Belt, a modern ethod of jointing, a faster installation on e job, and Tufflex, a cold trowelling stic for Sewer Pipe joints are the prod-ucts. Write Servicised Products Corp., 6051 W. 65 St., Chicago 38, Ill.

Pipe Joint Compounds

450. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Pumps, Sludge

452. Non-clogging, vertical or horizontal, dry pit or submerged; storm water and drainage pumps are described in several Bulletins; also sump and bilge pumps. Peerless Pump Div., Quincy, Ill.

Pumps and Well Water Systems

454. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for descriptive booklets. Advertising Dept., Layne & Bowler, Inc., Box 186, Hollywood Station, Memphis 8, Tenn.

455. Peerless pumps in a variety of types, with oil or water lubrication and any power drive, to pump water from any depth are described and illustrated in new literature that clearly shows their construction and special features. Write Peerless Pump Div., Food Machinery Corp., 301 W Ave. at 26th St., Los Angeles 31, Calif.

456. Oil lubricated turbine pumps with open impellers. Five types of heads available. Specifications and illustrations in new bulletin 6930M-2 issued by Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.

457. Centrifugal Pumps of various designs—single-stage, double-suction, split casing; single-stage single-suction; two-stage opposed impeller; three-stage; high-pressure; fire pumps; close-coupled. A bulletin for each type. Peerless Pump Div., Food Machinery Corp., Quincy, Ill.

Screens

460. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

Softening

466. This folder explains the process of Zeolite water softening and describes and illustrates the full line of equipment for that purpose made by the Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago 4, Ill. Includes flow charts, tables and other valuable data. Write for a copy of this instructive folder.

467. Water Softening. The use of the Spaulding Precipitator to obtain maximum efficiency and economy in water softening is described in a technical booklet. Permutit Co., 330 W. 42nd St., New York 18, N. Y.

Sprinkling Filters

469. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

Stand-by Motors

471. Buffalo stand-by motors for generators or pumping units are covered in illustrated specification sheets sent promptly by Buffalo Gasolene Motor Co., Dept. PW, Buffalo 3, N. Y.

Swimming Pools

474. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data, prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

475. A new illustrated bulletin on Graver Swimming Pool Equipment. Especially valuable to municipal and consulting engineers for use in writing up swimming pool specifications. Issued by Graver Tank & Mfg. Co., 332 So. Michigan Ave., Chicago 4, Ill.

Taste and Odor Control

476. "Taste and Odor Control in Water Purification" is an excellent 92-page, illustrated booklet covering sources of taste and odor pollution in water supplies and outlining the various methods of treatment now in use. Every water works department should have a copy. Write Industrial Chemical Sales Div., 230 Park Ave., New York 17, N. Y.

477. Technical pub. No. 207 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination, a method of discovering the point at which many causes of taste may be removed by chlorination with little or no increase in residual chlorine. Sent free to any operator requesting it.

Treatment

479. "Safe Sanitation for a Nation," an interesting booklet containing thumbnail descriptions of the different pieces of P.F.T. equipment for sewage treatment. Includes photos of various installations and complete list of literature available from this company. Write Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago 13, Ill.

480. New booklet (No. 1642) on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures; drawings of installations, sanitary engineering data and design details. Link-Belt Co., 2045 W. Hunting Park Ave., Philadelphia 40, Pa.

481. New 16-page illustrated catalog No. 1742 on Straightline Collectors for the efficient, continuous removal of sludge from rectangular tanks at sewerage and water plants. Contains layout drawings, installation pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

482. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

483. A combination mechanical clarifier and mechanical digester. The Dorr Clarigester is explained and illustrated in a bulletin issued by The Dorr Company, 570 Lexington Ave., New York 22, N. Y.

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485. New illustrated folder on Straightline apparatus for the removal and washing of grit and detritus from rectangular grit chambers. Address: Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

486. 28-page catalog describes and illustrates the Dorrco Hydro-Treator, a self-contained water treatment unit combining Flocculation, Sludge Thickening and Clarification. Reduces treatment time and lowers plant construction costs. The Dorr Co., 570 Lexington Ave., New York 22, N. Y.

487. The complete line of Jeffrey equipment for water, sewage and industrial waste treatment is illustrated and described in a handsome, new 40-page catalog just issued by The Jeffrey Mfg. Co., 947-99 North Fourth St., Columbus 16, Ohio.

488. "Packaged" Sewage Treatment Plants, specifically developed for small communities — 100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2438 Wolfram St., Chicago 18, Ill.

489. "Carter Controlled Flocculation" is title of illustrated folder available on request from Ralph B. Carter Co., Hackensack, N. J.

490. New bulletin fully describes and illustrates Hardinge sludge collectors for clarifiers, sludge concentration and skimming in both circular and rectangular tanks. Write Hardinge Company, Inc., York, Pa.

Underdrains, Trickling Filter

492. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh 12, Pa., for free copy.

Valves (See Gates, Air Release, etc.)

Water Treatment

496. "Use of copper sulphate in water treatment plants" titles informative booklet, with valuable data on chemicals, dosage, etc. Write Tennessee Corporation, Atlanta 1, Ga.

497. Ferri-floc Ferric Sulphate — a new, valuable booklet on coagulation for water and sewage treatment plants. Write Tennessee Corporation, Atlanta 1, Ga.

Water Service Devices

506. Data on anti-freeze outdoor drinking fountains, hydrants, street washers, etc., will be sent promptly on request to Murdock Mfg. & Supply Co., 426 Plum St., Cincinnati 2, Ohio.

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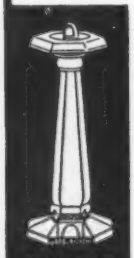

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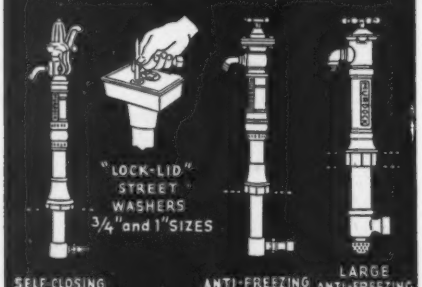
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A New Folder on Gasolene and Gas Engines

Buffalo Gasolene Motor Co.
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Bulletin No. 317 describes and illustrates a number of standby engines in use in water works and sewage treatment plants and for flood control. When you are interested in Standby Engines write for this bulletin.

Legal Aspects of Controlling Highway Access

Public Roads Administration
Washington 25, D. C.

Legal issues involved when access to streets and highways is restricted in order to provide better accommodations for through-traffic are discussed in a booklet issued by the Public Roads Administration.

The report, written by David R. Levin, of the Financial and Administrative Research Division of Public Roads, is entitled "Legal Aspects of Controlling Highway Access."

The author points out that access to certain streets and highways must be controlled to permit the free movement of large numbers of motor vehicles safely and conveniently. Uncontrolled access to express highways, he adds, would defeat the purpose for which the expressway was constructed.

He, discusses litigation in which property owners sought compensation because of restricted access to adjacent thoroughfares, and reviews judicial rulings governing abutting property owners' right of access to highways, and "Right of view."

Construction of urban expressways and parkways with controlled-access features is a logical step in progressive highway development, and compensation paid too liberally for alleged impairment of access rights will seriously impede the improvement of highways in congested metropolitan areas where the need for improvement is greatest, Mr. Levin declares.

While respecting the fundamental rights of property owners, courts also should give careful consideration to the rights and convenience of the traveling public, the writer suggests.

Copies can be obtained from the Public Roads Administration on request.

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